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Office of Civilian Radioactive Waste Management

Transportation System Requirements Document

Revision 3

November 2004

U.S. Department of Energy
Office of Civilian Radioactive Waste Management

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Transportation System Requirements Document
Revision 3

November 2004

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Having determined completion of technical review under procedures AP-6.28Q and LP-6.1.Q-OCRWM and compliance with requirements in accordance with the Program Change Control procedure LP-PMC-009-OCRWM, Program Change Control, the change to the baseline document is approved for release.

J Gary Lanthrum — 11/22/04

J. Gary Lanthrum, Director
Office of National Transportation

Date

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
PROGRAM BASELINE CHANGE CONTROL BOARD
REVISION/CHANGE RECORD

Document Number: DOE/RW-0425/D00000000-00811-1708-00002
Document Title: Transportation System Requirements Document

Revision Number/ Date	BCP Number	Revision/Change Description	Pages Affected
Rev. 01 March 1994	BCP-00-94-0001	Incorporates the Multi-Purpose Canister (MPC) concept into the CRWMS technical baseline.	All
Rev. 01 DCN 01 May 1995	BCP-00-94-0005	Resolves issues needed for the procurement of the MPC system. Also incorporates the collocation of the Cask Maintenance Facility at the MGDS. Additional changes were made to address CAR HQ-93-031.	viii, 16, 17, 18, 36, 37, 38, 39, 40, 44, 46, 47, 53, 55, 56, 93, 94, 96, 161, 167
Rev. 02 December 1995	BCP-00-94-0005	General revision to incorporate BCP-00-94-000 "Implementation of the Program Approach"	All
Rev. 02 DCN 01 June 1996	BCP-00-96-0002	Provides Notice to Users on MPC Policy In accordance with the BCP-00-96-0002, MPC Policy Change, approved January 31, 1996, by the Program Baseline Change Control Board, OCRWM will no longer lead the development efforts of the multipurpose canister (MPC). Therefore, the CRWMS will need to provide additional flexibility to accept and accommodate a variety of cask/canister systems for commercial spent nuclear fuel. General cask/canister performance definitions and requirements that define necessary system capabilities to accommodate SNF received in canisters with single-, dual-, or triple-purpose application will need to be maintained in the technical baseline, including systems which involve the handling and repackaging of uncanistered spent nuclear fuel. Accordingly, all readers and implementors of the Program-level technical baseline (i.e., the CRWMS Requirements Document and the four System Requirements Documents) are hereby notified that, until the next planned revision of the technical baseline is completed, the following policy will be used as the basis for technical planning. This administrative change shall be designated as Revision 2 Document Change Notice. (DCN) 1. The CRWMS will accept and accommodate a variety of cask/canister systems for commercial spent nuclear fuel which are currently available or are being developed.	Addendum, see following

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT PROGRAM BASELINE CHANGE CONTROL BOARD REVISION/CHANGE RECORD			
Document Number: DOE/RW-0425/D00000000-00811-1708-00002 Document Title: Transportation System Requirements Document			
Revision Number/ Date	BCP Number	Revision/Change Description	Pages Affected
		These may be individual spent fuel assemblies; or single, dual, or triple purpose cask or canister systems. The existing MPC design, if deployed, will be in accordance with the MPC procurement specification. Until specific canister or cask systems are developed, certified, and licensed, interface requirements affecting the designs of CRWMS structures, systems, and components must be adequately documented and controlled in accordance with the OCRWM Quality Assurance Requirements and Description document (DOE/RW-0333). Some items may be identified as To Be Verified or To Be Determined.	
Rev. 03 November 2004	TBD	Updates the TSRD to conform to the current Civilian Radioactive Waste Management System Requirements Document (CRD) Revision 6. Deletes references to obsolete facilities and equipment. Revises ONT Program (Level-2) requirements to be less prescriptive and more performance or function based. Reformats document to reflect ONT transportation sub-elements. Revises glossary and list of acronyms/ abbreviations to reflect terms used in document.	All

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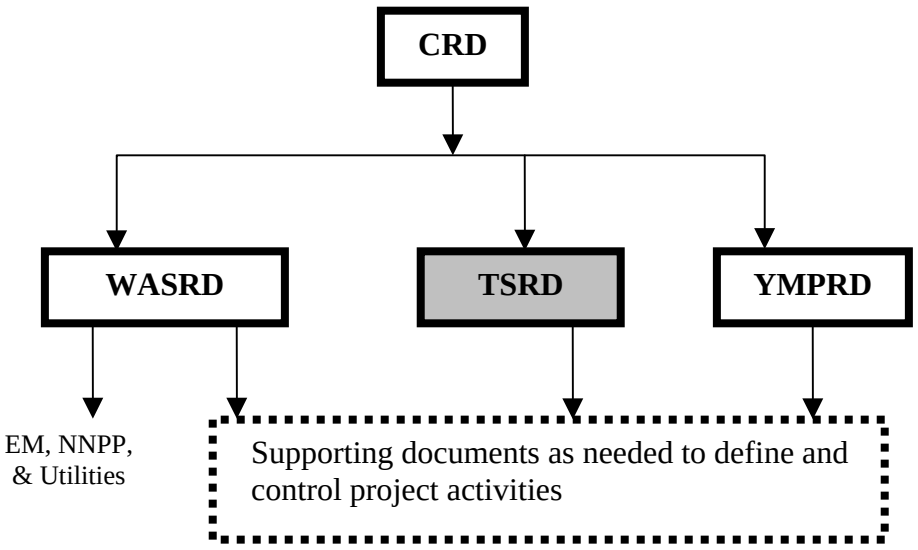
1.0 INTRODUCTION

1.1 PURPOSE

This document establishes the Transportation system requirements for the U.S. Department of Energy's (DOE's) Civilian Radioactive Waste Management System (CRWMS). These requirements are derived from the Civilian Radioactive Waste Management System Requirements Document (CRD). The Transportation System Requirements Document (TSRD) was developed in accordance with LP-3.1Q-OCRWM, Preparation, Review, and Approval of Office of National Transportation Level-2 Baseline Requirements. As illustrated in Figure 1, the TSRD forms a part of the DOE Office of Civilian Radioactive Waste Management (OCRWM) Technical Baseline.



NOTE: WASRD = Waste Acceptance System Requirements Document; YMPRD = Yucca Mountain Project Requirements Document; EM = DOE Office of Environmental Management; NNPP = Naval Nuclear Propulsion Program

Figure 1. Requirements Documents Form a Part of the DOE Office of Civilian Radioactive Waste Management (OCRWM) Technical Baseline

Revision 3 of this document identifies requirements for the current phase of the Transportation system which is focused on the acquisition of transportation cask systems, rolling stock, and Nevada rail. As plans for the other sub-elements mature, more detailed requirements will be identified in subsequent revisions to this document.

1.2 DOCUMENT ORGANIZATION

The TSRD is organized as follows:

Section 1: Introduction. This section presents an overview of the Transportation system element including the mission and system concept.

Section 2: Planning Considerations. This section identifies planning assumptions and considerations.

Section 3: Requirements. This section identifies the CRWMS Transportation system element requirements and allocation. Requirements that apply to the overall Transportation system are presented, followed by breakouts of the requirements for each sub-element. Interface requirements are also presented.

Section 4: Requirement Performance Evaluation and Verification. This section addresses how conformance with the requirements in Section 3 is to be verified.

Section 5: Notes. A glossary and list of acronyms and abbreviations are provided in this section.

Appendices: The appendices provide supporting information regarding the identification and allocation of requirements to the Transportation system. The following appendices are included:

A – Transportation Requirements Allocation and Traceability
B – Anticipated Interfaces

1.3 SYSTEM DEFINITION

The CRD identifies Transportation as an element of the CRWMS. This section defines the Transportation system (Transportation) element in terms of the functions it must perform and the sub-elements that will perform the functions.

The Transportation element is to provide capabilities and the supporting operational and maintenance infrastructure necessary to ship 70,000 metric tons of spent nuclear fuel (SNF) and high-level radioactive waste (HLW) to the Geologic Repository at Yucca Mountain. Transportation will also provide capabilities to transport additional quantities of SNF and HLW beyond 70,000 metric tons, as required.

1.3.1 Function of Transportation within CRWMS

Figure 2 shows the functional flow diagram for the primary functions of the CRWMS. SNF and HLW are accepted into the CRWMS by the Accept Waste function. This function transfers custody of the waste to the Transport Waste function, which moves the waste to the Dispose of Waste function.

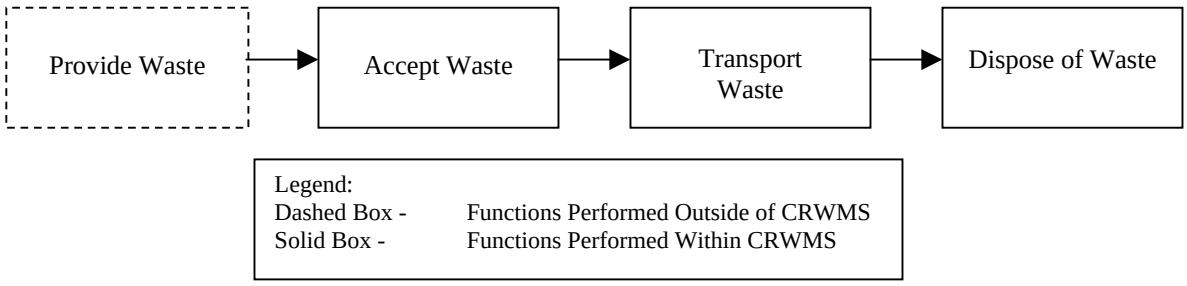


Figure 2. Functional Flow Diagram for the Primary Functions of the CRWMS

1.3.2 System Description

Transportation is an integral part of the total CRWMS in which all system elements, subsystems, and facilities are described as parts of a single system. Transportation will receive casks loaded with SNF and HLW for transportation, ship the waste to the permanent Repository at Yucca Mountain, and operate the Transportation system. This includes managing and monitoring traffic, maintaining all subsystems, and performing other functions as required to meet applicable regulations, policies, and agreements.

Figure 3 shows the flow of hardware and equipment within the Transportation functions. All SNF and HLW shipped to the Yucca Mountain Repository will be packaged within Nuclear Regulatory Commission (NRC) certified transportation casks that meet all applicable requirements of 10 CFR 71. Transportation operations will be managed from the Operations Center, which will provide coordination with the shipping sites, the Repository, and the Fleet Management Facility (FMF).

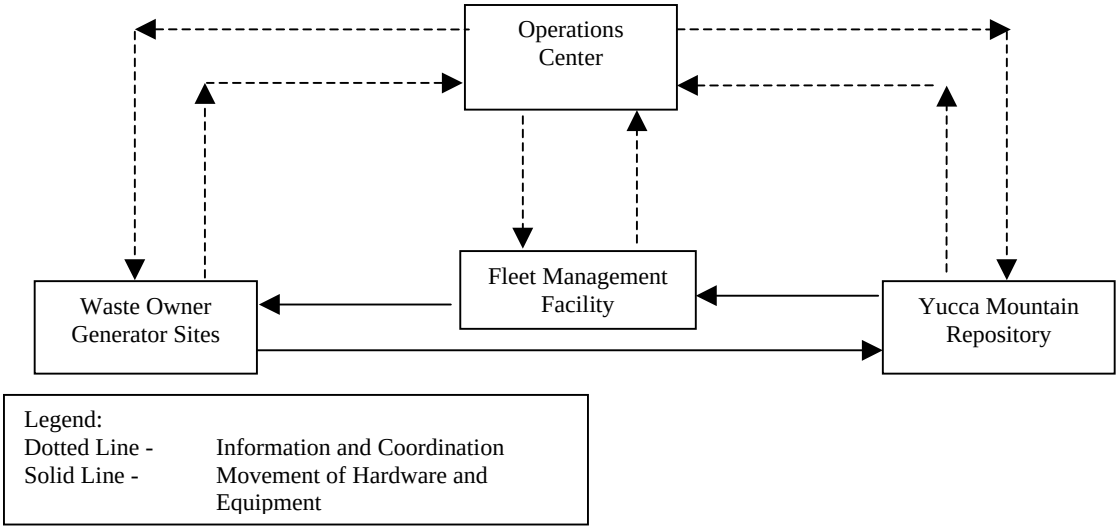


Figure 3. Transportation Functional Flow Diagram

The Office of National Transportation (ONT) will initiate acquisitions to obtain facilities, infrastructure, equipment, and services necessary to transport SNF and HLW to the Repository to support the planned startup of Yucca Mountain in 2010. Activities include the work scope related to acquiring, testing, and certifying the readiness of a transportation system to support the mission objective to transport SNF and HLW from the commercial and DOE sites where it is now located to the permanent Repository at Yucca Mountain.

1.3.3 Transportation System Sub-elements

Transportation consists of the following sub-elements:

Program and Project Management – Those activities necessary to develop, implement and maintain a management system and infrastructure necessary to effectively manage national

transportation. It includes planning and integration, budget, management and control, and supporting functions.

Cask Systems – Those activities necessary to ensure that the cask fleet will be acquired to deliver commercial and DOE SNF and HLW to Yucca Mountain including acquisition of the necessary truck and rail cask systems and associated ancillary equipment.

Rolling Stock – Those activities necessary to ensure that the rolling stock will be acquired to deliver commercial and DOE SNF and HLW to Yucca Mountain including acquisition of cask rail cars, buffer rail cars, escort rail cars, and locomotives.

Support Facilities – Those activities necessary to ensure that support facilities needed for Transportation functions including operations and maintenance will be acquired.

Operations – Those activities necessary to plan, operate, and maintain the transportation systems (including safeguards and security) necessary to support the overall Transportation mission. Operations address the facilities and hardware that support receipt, handling, loading, and shipping activities. Also included is support for incident response for in-transit operations and operations over the Nevada Rail branch line.

Institutional – Those activities necessary to ensure that institutional interactions with industry, States, Tribes, and local governments support the Transportation mission.

Nevada Rail – Those activities necessary to ensure that the transportation infrastructure in Nevada will support Transportation goals for the delivery of SNF and HLW to Yucca Mountain. This includes a railway line and supporting environmental work.

2.0 PLANNING CONSIDERATIONS

The TSRD is based on the following planning considerations and assumptions:

A. Receipt of SNF at the MGR will commence in 2010.

B. The Waste Acceptance organization is responsible for the functional interfaces with the Waste Providers (Purchasers/Producers/Custodians). Transportation will interface with the Waste Providers through the Waste Acceptance organization.

C. Transfer operations at the Purchaser facilities are governed by each Purchaser's operating or possession license.

D. The DOE will own and maintain rail rolling stock (i.e., locomotives, cask cars, buffer cars, and escort cars) and the casks and ancillary equipment necessary for safe, secure, and efficient transportation.

E. The DOE plans to implement Association of American Railroads (AAR) Standard – 2043 for Rolling Stock Acquisition.

F. OCRWM's rail shipments of SNF and HLW will be made using dedicated trains. Unloaded/empty casks may be shipped by dedicated train or by general freight service.

G. A branch rail line along the Caliente corridor will be constructed in Nevada to connect a mainline railroad with the repository.

H. The Nevada rail line will be designed, constructed, operated, and maintained so that shared use of the Nevada rail line shall not be precluded.

I. The branch rail line will be operational in time to support repository operations in 2010.

J. In the event the Nevada rail line will not be available to support receipt of SNF and HLW at the repository in 2010, an intermodal transfer (IMT) facility may be designed, constructed and operated until the Nevada rail line is operational.

K. The Transportation system will include a government-owned Operations Center.

L. The Transportation system will be designed to allow collocation of the FMF.

M. Nuclear Waste Policy Act (NWPA) Section §180(c) funding will be available to States and Tribes prior to operational testing/readiness review.

N. The amount of SNF and HLW, the originating sites, and the planned shipment schedules are determined by the Waste Acceptance function.

O. Shipments of SNF and HLW will be made by rail to the maximum extent practicable.

3.0 REQUIREMENTS

This section identifies the requirements applicable to the Transportation system element of the CRWMS. Requirements were identified from a variety of source documents such as the CRD, Federal laws and regulations, DOE Orders and directives, interagency and interdepartmental agreements, OCRWM policy and technical decision documents, and consensus standards.

3.1 IDENTIFICATION AND APPLICATION OF REQUIREMENTS

Requirements included in the TSRD are annotated to show traceability to the source documents on which the requirements are based. Traceability is shown by identifying the source document(s) in square brackets following a statement of the requirement. Additionally, the legal, regulatory, or technical basis for the requirements is documented on Requirements Analysis Sheets (RASs) in the quality assurance record package for the TSRD. The RASs provide a statement of the requirement as it appears in the TSRD, a statement of the original source, and, where applicable, a rationale for any interpretation of the basic requirement. Where a requirement has been removed by this revision, the rationale is provided on the RAS. These records are not included within the TSRD itself but for Revision 3 of the TSRD they can be accessed through Records Management under records package # QRP-04-1140.00.

3.1.1 Precedence of Requirements

The order of precedence for requirements for this TSRD is as follows:

- Federal laws, treaties, and Executive Orders;
- Requirements of Federal agencies and departments (e.g., DOE, NRC, Environmental Protection Agency (EPA), and Department of Transportation (DOT));
- State and Tribal laws;
- Local ordinances; and
- National and international standards.

The TSRD provides the Transportation Program-Level (Level-2) requirements. The order of precedence for development of the technical baseline as reflected in the OCRWM document hierarchy, which is provided in the Major System Management Policy, is the CRD (Level-1), Level-2 Technical Baseline Documents (including the TSRD), and Level-3 Technical Baseline Documents.

3.1.2 Assignment of Programmatic and Project-Level Requirements

The Transportation system shall comply with the applicable provisions of the laws, regulations, directives, and other requirements identified in Appendix A. Appendix A shows the allocation of requirements to specific Transportation sub-elements as well as requirements that apply to

more than one sub-element or the overall Transportation system (programmatic requirements). Appendix A also indicates the TSRD sections where requirements are cited.

3.2 TRANSPORTATION PROGRAMMATIC REQUIREMENTS

3.2.1 General

A. SNF and HLW shall be transported to the Geologic Repository for disposal. All of the commercial SNF, DOE SNF, and vitrified defense and commercial HLW must be as specified in the standard contracts or other DOE agreements and meet the requirements specified in the WASRD (DOE/RW-0351). [10 CFR 961.11, Art IV.B.1] [Presidential Memo 1985] [CRD 3.2.1.A] [CRD 3.3.2.F] [WASRD]

B. The waste transport capability shall be operational with the commencement of CRWMS facilities operations, and must continue until such time as all SNF and HLW, as specified in standard contracts and in the Memorandum of Agreement (MOA) between EM and RW, has been received at the Geologic Repository. [NWPA 42 USC §10222(a)(5)] [CRD 3.1.2.A] [CRD 3.2.1.A] [CRD 3.2.1.B] [CRD 3.3.1.B] [CRD 3.3.2.F]

C. Transportation shall accommodate approximate waste types and quantities as follows:

- 63,000 metric tons of heavy metal (MTHM) of commercial SNF
- 2,268 MTHM of DOE SNF (does not include naval SNF)
- 4,667 MTHM equivalent of defense and commercial HLW

Note that Navy will be responsible for the delivery of its fuel to the Repository. [CRD 3.2.1.C]

D. Transportation shall be capable of transporting waste at the following minimum annual rates:

- 400 MTHM in calendar year 2010,
- 600 MTHM in calendar year 2011,
- 1,200 MTHM in calendar year 2012,
- 2,000 MTHM in calendar year 2013, and
- 3,000 MTHM per year by 2014.

[CRD 3.2.1.B]

E. Transportation shall be capable of accommodating a range of storage and transportation technologies, including multipurpose, dual-purpose, and single-purpose canisters, as well as bare SNF assemblies. [CRD 3.2.1.E]

F. Facilities shall be provided for the storage of all spare parts, replaceable equipment, and consumable material in an environment conducive to their safekeeping and protection. [10 CFR 71.127] [QARD Sect. 13] [CRD 3.3.2.B]

G. Facilities shall be provided to support training required by DOE Order 433.1. [DOE Order 433.1] [CRD 3.3.2.D]

H. Facilities and equipment shall be provided to implement support functions such as administration (e.g., security, public outreach activities, etc.) and logistics (e.g., maintenance, utilities, etc.). [DOE Order 413] [CRD 3.3.2.D]

I. Design and operational interfaces within each system element shall be identified, controlled, and coordinated among participating organizations, including writing procedures for review, approval, release, distribution, and revision of documents involving design and operational interfaces. [10 CFR 71.105] [QARD Sect. 2.2.5] [QARD Sect. 3] [QARD Sect. 5.1] [QARD Sect. 5.2.1] [CRD 3.3.2.B] [CRD 3.3.2.D]

J. Transportation shall use private industry to the maximum extent practicable for the transport of SNF and HLW to the Geologic Repository and shall encourage the use of vendors and suppliers located within close proximity to planned facilities. [NWPA 42 USC §137(a)(2)] [CRD 3.1.1.E]

K. Records shall be maintained in accordance with DOE Order 200.1, DOE Order 414.1, Quality Assurance Requirements and Description (QARD) (DOE/RW-0333P), and as required by 10 CFR 63.71, 10 CFR 71.91, and 10 CFR 71.135 for recordkeeping related to cask systems. [10 CFR 63.71(a),(b)] [10 CFR 71.91] [10 CFR 71.135] [DOE Order 200.1] [DOE Order 414.1] [QARD Sect. 17] [CRD 3.3.2.D]

L. The Transportation System and its contractors shall comply with energy and utilities management requirements as specified in DOE Order 430.2, including the establishment of an energy management program and preparation/implementation of an energy management plan. [DOE Order 430.2] [CRD 3.1.2.G] [CRD 3.2.2.D]

M. The Transportation System shall comply with all applicable Coast Guard requirements when transporting by barge. [33 CFR 1-199]

N. Transportation shall comply with the applicable principles of the "Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management" (IAEA 1997). [CRD 3.1.1.D]

O. Transportation shall support the CRWMS evaluation of the need for a second Repository, in accordance with NWPA Section 161(b). [CRD 3.1.1.I]

P. Transportation shall be capable of handling and transporting NRC-certified transportation casks, including the following general types:

- Single-Purpose Casks,
- Canister Casks,
- Transportable Storage Casks (TSCs),
- HLW Casks, and
- Specialty Casks.

[CRD 3.3.2.E]

3.2.2 Design and Construction

A. General

1. Land acquisition for Transportation shall be accomplished in a manner consistent with appropriate Federal regulations including requirements associated with land withdrawal processing in accordance with 43 CFR 2300. [43 CFR 2300.0-1] [CRD 3.3.2.D]

2. The design, construction, operation, maintenance, and management of CRWMS facilities shall comply with the applicable requirements of 41 CFR 109-102-50. [41 CFR 109-102-50] [CRD 3.2.1.J]

B. Design Criteria - Facilities

1. National standards (e.g., ASME, ANSI, ASTM), NRC guidance (e.g., NUREGs, Regulatory Guides), and other DOE accepted documents, identified as sufficient or more appropriate for the support of design shall be used at the discretion of the designers, provided there are no conflicts with the identified requirements of Transportation or the CRWMS. [QARD Sect. 3.2.1] [CRD 3.2.1.J]

2. Design and construction of all Transportation facilities shall be accomplished using industry codes, standards, and engineering principles and practices considering the guidance in the appropriate sections of DOE HDBK-1132-99. Each DOE organization shall select, use, and adhere to appropriate voluntary consensus standards (VCSs), consistent with PL 104-113 and Office of Management and Budget (OMB) Circular A-119 (i.e., use suitable existing VCSs in lieu of developing new DOE Technical Standards), when choosing technical standards to support assigned DOE missions and functions, including the design, construction, testing, modification, operation, decommissioning, decontamination, and remediation of DOE's facilities and activities. [DOE Order 252.1] [CRD 3.2.1.J] [CRD 3.3.2.D]

3. Transportation facilities shall be designed and constructed to withstand the effects of natural phenomena hazards, and to reflect appropriate combinations of the most severe of the natural phenomena reported for the area, and normal and accident conditions. [DOE Order 420.1] [CRD 3.3.2.D]

4. Facilities and equipment design shall consider a maintenance concept that minimizes the likelihood of, and mitigates the effects of systems, structures, and components (SSC) failures using preventive maintenance and inspection. SSCs shall be designed to permit periodic testing, inspection, and maintenance, as necessary, to ensure their continued functioning and readiness. [DOE Order 420.1] [CRD 3.3.2.D]

C. Design Criteria - Systems and Equipment

1. The capability shall be provided to conduct radiological surveys and security inspections of Transportation cask systems at the entry to the restricted area of the

Repository in accordance with 10 CFR 20 and 10 CFR 71 to the extent permitted by available space and equipment. [10 CFR 71.89] [CRD 3.3.2.B]

2. Technical information and documentation on the equipment supplied with Transportation cask systems shall be provided to the Repository in sufficient time prior to unloading operations to allow for the development of, training on, and testing of site-specific procedures. [QARD Sect. 5.2]

3. Transportation cask systems design shall facilitate decontamination of external surfaces of loaded or unloaded casks at the Repository prior to shipment to the extent required by 10 CFR 71. [10 CFR 71.87(i)] [49 CFR 173.443(a)] [CRD 3.3.2.B] [CRD 3.3.2.C]

4. Design and construction of systems and equipment shall be accomplished using industry codes, standards, engineering principles and practices; with particular attention to those which incorporate system safety, human factors, reliability, availability, maintainability, habitability standards, and environmental protection; and considering the guidance in the appropriate sections of DOE HDBK-1132-99. [DOE Order 252.1] [CRD 3.2.1.J] [CRD 3.3.2.D]

5. The workmanship criteria shall reflect the currently applicable codes, standards, and engineering principles and practices including but not limited to:

AAR	Association of American Railroads
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ANS	American Nuclear Society
ANSI	American National Standards Institute
AREA	American Railway Engineering Association Air Conditioning and Refrigeration Institute
AREMA	American Railway Engineering and Maintenance-of-Way Association
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating Refrigerating and Air-Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATA	American Trucking Association
AWS	American Welding Society
IEEE	Institute of Electrical and Electronics Engineers
MBMA	Metal Building Manufacturers Association
NAAMM	National Association of Architectural Metal Manufacturers
NAPHCC	National Association of Plumbing-Heating-Cooling Contractors
NCMA	National Concrete Masonry Association
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NIST	National Institute of Standards and Technology (formerly National Bureau of Standards)

PCA Portland Cement Association
PCI Pre-stressed Concrete Institute

[DOE Order 252.1] [CRD 3.2.1.J] [CRD 3.3.2.D]

6. Transportation designs shall comply with the agreements established under the Integrated Interface Control Document (DOE/RW-0511) to ensure: compatibility of DOE-owned SNF and HLW waste forms with Geologic Repository surface facility interfaces, including canister handling interfaces; and compatibility between transportation equipment (e.g., transporters) and transported items (e.g., casks and canisters) with mechanical and envelop interfaces. [IICD] [CRD 3.2.1.G]

3.2.3 Safety and Environmental Protection

A. Safety

1. Occupational and public doses shall be maintained as low as is reasonably achievable (ALARA), per the applicable provisions of 10 CFR 20, Standards for Protection Against Radiation, and within the regulatory limits. DOE Guide 441.1-2 provides guidance for the implementation of ALARA principles. [DOE Order 420.1] [CRD 3.3.2.D]

2. SNF and HLW shall be transported in a manner that protects the health and safety of the public and the environment. [NWPA 42 USC §10131(a)(4)] [CRD 1.3.1] [CRD 3.1.1.D] [CRD 3.1.2.A]

3. In compliance with occupational safety and health standards promulgated under 29 USC §651 et seq., Transportation work places shall be free from recognized hazards that are causing or likely to cause death or serious physical harm to employees. Free from recognized hazards means that the hazards are eliminated or mitigated to the point that they no longer pose a serious threat. [29 CFR 1910] [29 CFR 1960] [CRD 3.1.2.D]

4. Transportation facilities shall be provided fire protection in accordance with DOE Order 420.1 or 41 CFR 102-80.45 as applicable. [41 CFR 102-80.45] [DOE Order 420.1] [CRD 3.2.1.J] [CRD 3.3.2.D]

5. Transportation shall adhere to the applicable safety and health requirements for construction contained in 29 CFR 1926. [29 CFR 1926] [CRD 3.1.2.D]

B. Environmental Protection

An environmental management program that meets the requirements of DOE Order 450.1 shall be developed and implemented for Transportation design, construction, and operation of facilities and equipment. The program shall include:

1. The systematic planning, integrated execution, and evaluation of programs for (a) public health and environmental protection as stated in the National Environmental Policy Act of 1969 (NEPA), (b) pollution prevention, and, (c) compliance with

applicable environmental protection and permitting requirements including the applicable requirements of Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

2. Policies, procedures, and training to identify activities with significant environmental impacts, to manage, control, and mitigate the impacts of these activities, and to assess performance and implement corrective actions where needed.

3. Measurable environmental goals, objectives, and targets that are reviewed annually and updated when appropriate.

4. Consideration of the following for inclusion as applicable:

    - conformity of DOE proposed actions with State Implementation Plans to attain and maintain national ambient air quality standards,
    - implementation of a watershed approach for surface water protection,
    - implementation of a site-wide approach for groundwater protection,
    - protection of other natural resources including biota,
    - protection of site resources from wildland and operational fires, and
    - protection of cultural resources.

5. The promotion of the long-term stewardship of a site's natural and cultural resources throughout its operational, closure, and post-closure life cycle.

6. The reduction or elimination the generation of waste, the release of pollutants to the environment, and the use of Class I ozone-depleting substances through source reduction, re-use, segregation, and recycling and by procuring recycled-content materials and environmentally preferable products and services.

7. Ensuring the early identification of, and appropriate response to, potential adverse environmental impacts associated with DOE operations, including, as appropriate, pre-operational characterization and assessment, and effluent and surveillance monitoring.

[42 USC §4321 et seq.] [42 USC §9601 et seq.] [10 CFR 1021] [DOE Order 450.1] [CRD 3.2.1.I] [CRD 3.2.1.J] [CRD 3.3.2.A] [CRD 3.3.2.D]

3.2.4 Waste Management

A. Radioactive waste generated by Transportation facilities and operations shall be managed in accordance with the requirements of DOE Order 435.1. [DOE Order 435.1] [CRD 3.2.1.I] [CRD 3.3.2.D]

B. Facilities shall be provided to manage and dispose of site-generated, solid, non-hazardous wastes in compliance with the Solid Waste Disposal Act as implemented in the applicable Federal regulations including 40 CFR 243 and 40 CFR 246. Arrangement may be made for off-site disposal. [40 CFR 243.100(a)] [40 CFR 243.200(d)] [40 CFR 246.100(a),(b)] [DOE Order 450.1] [CRD 3.2.1.I] [CRD 3.3.2.D]

C. Facilities, ancillary equipment, tools, fixtures and associated spare parts shall be designed to provide the capability to minimize the generation of radioactive mixed waste during operation. [40 CFR 261.1(a)] [40 CFR 262.11] [CRD 3.2.1.I] [CRD 3.3.2.D]

D. The management, transport, and disposal of any solid and hazardous wastes generated by transportation facilities and operations shall be conducted in accordance with the requirements of the Resource Conservation and Recovery Act (RCRA) (42 USC §6901 et seq.) which could include RCRA permitting for the hazardous wastes, and applicable State, local, or Tribal regulations. Applicable Federal regulations include 40 CFR 261, 40 CFR 262, and 40 CFR 263. [42 USC §6901 et seq.] [40 CFR 261.1(a)] [40 CFR 262.11] [40 CFR 263.10(a)] [CRD 3.2.1.I] [CRD 3.3.2.D]

3.2.5 Safeguards and Security

Transportation shall incorporate physical protection and security systems in facilities and coordinate equipment and personnel to ensure compatibility and facilitate compliance with the security requirements of 10 CFR 75 and applicable DOE Orders. [10 CFR 71.0(b)] [10 CFR 75.2] [DOE Order 420.1] [DOE Order 460.2] [CRD 3.1.2.E] [CRD 3.1.2.F] [CRD 3.3.2.B] [CRD 3.3.2.C] [CRD 3.3.2.D]

3.2.6 Communications

A. Transportation shall have communication equipment that is compatible with other elements of CRWMS. Transportation segments communications equipment shall include provisions for:

1. All communications equipment required for security, including off-site equipment, remain operable from independent power sources in the event of loss of primary power. [49 CFR 173.22] [DOE Order 420.1] [CRD 3.3.2.C] [CRD 3.3.2.D]

2. Communication equipment to report an accident, incident, loss of any shipment of SNF/HLW, or the occurrence of a safeguards event as required in the Emergency Response Plan prepared for shipments. [49 CFR 173.22] [CRD 3.3.2.C]

3.2.7 Emergency Preparedness

A. Transportation shall develop an Emergency Management Program and ensure that Emergency Response Plans are developed for Transportation facilities and activities in accordance with DOE Order 151.1 and DOE Order 460.2. [DOE Order 151.1] [DOE Order 460.2] [CRD 3.3.2.D]

B. Carriers shall develop an emergency response plan that addresses activities to be conducted in the event of an accident or incident, and provide crews and security personnel with written procedures that clearly define actions to be taken in an emergency. [49 CFR 172.600] [DOE Order 151.1] [CRD 3.3.2.C] [CRD 3.3.2.D]

3.2.8 Quality Assurance

A quality assurance (QA) program shall be developed and maintained to ensure delivered products and services meet prescribed requirements. [10 CFR 71.101] [DOE Order 414.1] [QARD Sect. 7] [CRD 3.3.2.B] [CRD 3.3.2.D]

3.2.9 Program and Project Management

A. The acquisition of capital assets shall be managed as specified in DOE Order 413.3. [DOE Order 413.3] [CRD 1.2]

B. In addition to satisfying the requirements of the specifications, Transportation shall establish programs to ensure, at the commencement of operations, the availability of a sufficient number of trained personnel and validated documentation to conduct operations. [10 CFR 71.105(d)] [QARD Sect. 2.2.8] [CRD 3.3.2.B]

C. Transportation shall establish logistics support systems to include ensuring the availability of sufficient spares to support the maintenance concept and the design availability factors used in the design. [DOE Order 430.1] [DOE Order 433.1] [CRD 3.3.2.D]

D. Transportation shall adopt initiatives and practices (e.g., value engineering) that ensure cost reduction and savings during its planning, design, construction, and operational phases consistent with DOE Order 413.1, Management Control Program. Transportation shall participate in annual management reviews of cost reduction goals, including science and technology initiatives. In addition, Transportation shall conduct periodic independent cost estimating reviews to assess the effectiveness of cost reduction goals and develop approaches to integrate science, technology, and operational advancements into cost savings. [DOE Order 413.3] [DOE Order 430.1] [CRD 3.1.1.G] [CRD 3.1.1.H]

E. Activities shall be conducted consistent with the technical management approach defined in the Civilian Radioactive Waste Management Major System Management Policy (DOE/RW-0528). [CRD 3.1.1.C]

F. Starting in 2005, Transportation shall support OCRWM's "bottoms-up" Total System Life Cycle Cost analyses as required. [CRD 3.1.1.F]

3.3 CASK SYSTEMS REQUIREMENTS

Transportation cask systems shall be used to transport SNF and HLW to the Geologic Repository at Yucca Mountain. A cask is a container for the packaging and/or shipping of spent nuclear fuel or high-level waste. A cask system is a cask and associated components such as impact limiters, tie-down devices and personnel barriers, tools, and ancillary equipment necessary to ensure compliance with the package requirements of 10 CFR 71. The transportation casks provide a robust, sealed, shielded package that will contain the SNF or HLW, provide acceptable radiation levels outside the package, ensure criticality control, and manage heat rejection from the SNF and HLW during shipment. Several models of cask systems will be necessary to package the

various fuel types and waste forms designated for transport and to accommodate the infrastructure capabilities of the Purchaser, Producer, and Custodian sites. The casks may be transported via multiple modes of transportation. The following sections list the fundamental requirements of the casks. The requirements in this section supplement the requirements specified in 3.2, Transportation Programmatic Requirements and 3.6, Operations Requirements.

3.3.1 Characteristics

A. Casks that are certified by the NRC shall be provided for the transportation of SNF and/or HLW. [NWPA 42 USC §10157(a)(1)] [NWPA 42 USC §10175(a)] [CRD 3.2.1.H]

B. Casks shall be capable of transporting commercial SNF and HLW as defined in 10 CFR 961 or other agreement. [10 CFR 961] [CRD 3.3.2.F]

C. Casks shall be capable of transporting government-managed SNF and HLW accepted for disposal by Waste Acceptance, including DOE SNF canisters, bare DOE SNF and HLW as described in the WASRD (DOE/RW-0351), and the MOA between EM and RW and the EM/RW Memo dated December 19, 2003 regarding clarification of roles and responsibilities. [MOA EM/RW] [EM/RW Memo to Under Secretary dated December 19, 2003] [CRD 3.2.1.A][WASRD]

3.3.2 Design and Construction

Casks shall be designed, fabricated, tested, maintained, and inspected in accordance with 10 CFR 71. [10 CFR 71] [CRD 3.3.2.B]

3.4 ROLLING STOCK REQUIREMENTS

This section defines the requirements for the Rolling Stock that will be acquired to transport commercial and DOE SNF/HLW to Yucca Mountain. The requirements in this section supplement the requirements specified in 3.2, Transportation Programmatic Requirements and 3.6, Operations Requirements. Rolling Stock is defined as locomotives, cask cars, buffer cars, and escort cars used in rail transportation. The cask cars will be designed to carry commercial and DOE SNF/HLW in NRC certified transportation casks. The escort car will house and support the crew and equipment (escorts/responders and hardware systems) for multiple-day assignments, providing security during the transport of the SNF/HLW casks. Buffer cars will be used to separate the loaded cask cars from the locomotives and the escort cars. There will be a minimum of two buffer cars and one escort car per train. [49 CFR 174.85] [CRD 3.3.2.C]

3.4.1 General Requirements

A. Rolling Stock shall be designed, fabricated, tested, and maintained according to the AAR Manual of Standards and Recommended Practices Section J – Specification for Quality Assurance Specification M-1003. [DOE Order 252.1] [CRD 3.2.1.J] [CRD 3.3.2.D]

B. All cask, buffer, and escort cars used in rail transportation shall meet the applicable requirements identified in the following documents:

1. All applicable standards within the AAR Manual of Standards and Recommended Practices (MSRP), [DOE Order 252.1] [CRD 3.2.1.J] [CRD 3.3.2.D] [AAR MSRP]

2. AAR Standard M-1001, [DOE Order 252.1] [CRD 3.2.1.J] [CRD 3.3.2.D] [AAR S-M-1001]

3. AAR Field Manual of the Interchange Rules, [DOE Order 252.1] [CRD 3.2.1.J] [CRD 3.3.2.D] [AAR Field Manual of the Interchange Rules]

4. AAR Office Manual of the Interchange Rules, [DOE Order 252.1] [CRD 3.2.1.J] [CRD 3.3.2.D] [AAR Office Manual of the Interchange Rules]

5. The procurement specifications for each rail car, which will provide additional technical, design, performance, and interface requirements and will also identify additional Federal regulations and industry standards, as applicable. [DOE Order 252.1] [CRD 3.2.1.J] [CRD 3.3.2.D]

3.4.2 Specific Requirements

A. Locomotives: TBD (requirements to be determined by December 2006).

B. Cask cars: TBD (requirements to be determined by December 2006).

C. Escort cars: The Escort cars shall be designed to operate within clearances defined by AREMA Plate-C. [DOE Order 252.1] [CRD 3.2.1.J] [CRD 3.3.2.D] [AREMA Manual for Railway Engineering]

D. Buffer car requirements: The Buffer cars will be designed to operate within clearances defined by AREMA Plate-C. [DOE Order 252.1] [CRD 3.2.1.J] [CRD 3.3.2.D] [AREMA Manual for Railway Engineering]

3.5 FLEET SUPPORT FACILITY REQUIREMENTS

This section defines the requirements for design and construction of fleet support facilities that will be acquired to conduct Transportation operations and maintenance. The requirements in this section supplement the requirements specified in 3.2, Transportation Programmatic Requirements and 3.6, Operations Requirements.

Transportation will be responsible for the management and maintenance of all equipment used to transport SNF and HLW to the Geologic Repository and will require services of numerous support facilities to fulfill this responsibility. Key among these facilities is the FMF. Other smaller-scale facilities may include the following:

Operations Center – All transportation operations will be managed from the Operations Center. The following functional capabilities will be provided through the Operations Center: coordination with the shipping sites, the Repository, and the FMF; scheduling of casks, ancillary equipment, rolling stock and carriers; notification of States and Tribes; monitoring and tracking

of shipments; en route communication; emergency management; and security. The functional capabilities of the Operations Center are addressed in Section 3.6, Operations Requirements.

Training Facilities – Facilities where operating staff from the Repository, service contractors, utilities, and EM sites can be trained on the use of the transportation fleet equipment, operating procedures can be validated, and equipment operating practices can be tested and optimized.

Intermodal Transfer Facilities – Facilities used to support transfer of materials and equipment between various transportation modes such as truck, rail, or barge. Such facilities would be necessary in the event that operational considerations require that casks (or other equipment) be transferred from one mode of transportation to another.

3.5.1 Fleet Management Facility

A. Adequate on-site facilities and capabilities shall be provided to ensure that transportation cask systems are maintained to meet operational needs and Certificate of Compliance requirements. [10 CFR 961.11, Art IV.B.2] [CRD 3.2.1.A] [CRD 3.2.1.E] [CRD 3.3.2.B] [CRD 3.3.2.C] [CRD 3.3.2.F]

B. The FMF shall have the capability to handle, maintain, and certify the transportation cask fleet and any supporting equipment. As a minimum, this includes one visit per cask per year for annual certification and major maintenance. [10 CFR 71.87] [10 CFR 961.11, Art IV.B.2] [CRD 3.2.1.A] [CRD 3.2.1.B] [CRD 3.2.1.E] [CRD 3.2.1.H] [CRD 3.3.2.B] [CRD 3.3.2.F]

C. FMF staff shall have access to the record system containing all cask system documentation including shop fabrication and as-built drawings, Certificates of Compliance, Safety Analysis Reports (SARs), and fabrication QA records. [10 CFR 961.11, Art IV.B.2] [CRD 3.3.2.F]

D. The FMF shall be capable of controlling the handling, storage, shipping, cleaning, and preservation of materials and equipment to be used in packaging to prevent damage or deterioration. When necessary for particular products, special protective environments, such as inert gas atmosphere, and specific moisture content and temperature levels shall be specified and provided. [10 CFR 71.127] [CRD 3.3.2.B]

E. Casks shall be maintained and refurbished at the FMF to comply with the terms and conditions of the Certificates of Compliance and the applicable requirements of 10 CFR 71, Subparts A, G, and H. [10 CFR 71.12(c)(2)] [10 CFR 71, Subparts A, G, and H] [CRD 3.3.2.B]

F. The capability shall be provided at the FMF to create and update records of all tests and inspections for each cask system (in accordance with 10 CFR 71, Subparts G and H) including special tools and fixtures, and ancillary equipment; all maintenance performed, including components replacement; all decontamination performed; all cask system usage; and all cask reconfigurations. [10 CFR 71, Subparts G and H] [10 CFR 961.11, Art IV.B.2] [CRD 3.3.2.B] [CRD 3.3.2.F]

G. Decontamination of Transportation Cask Systems

1. The FMF shall have the capability to decontaminate cask system components, cask internal and external surfaces, and transport vehicles to levels required by 49 CFR 173.428 for empty Class 7 (radioactive) materials packaging or to levels required by agreements with individual Purchaser/Producer/Custodian sites, whichever are more stringent. [10 CFR 961.11, Art IV.B.2] [49 CFR 173.428] [CRD 3.3.2.C] [CRD 3.3.2.F]

2. Ancillary equipment, tools and fixtures shall be transported to and from the FMF in accordance with all applicable requirements of 49 CFR 171-178. [49 CFR 171-178] [CRD 3.3.2.C] [CRD 3.3.2.F]

H. The FMF handling and lifting equipment shall be capable of moving and lifting the cask system or components weighing up to 200 tons to the appropriate position in the FMF and onto transporters or other transfer equipment. [10 CFR 961.11 Art IV.B.2(c)]

I. Tests and Inspection

1. The FMF shall have the capability to perform all tests and inspections required by regulation (10 CFR 71.123) or Transportation system requirements for transportation cask systems. The tests or inspections may be performed on new or contaminated casks, components of casks, special tools and fixtures, ancillary equipment, and vehicles prior to release for shipping campaigns. [10 CFR 71.123] [49 CFR 173.1(a)(2)] [CRD 3.3.2.B] [CRD 3.3.2.C]

2. Instruments, meters, and measuring tools shall be provided at the FMF to conduct dimensional and visual inspections of casks, components, surfaces, containment seals (e.g., helium leak testing) and load testing as necessary. [QARD Sect. 12]

J. As a result of the inspections and tests, routine replacement of certain cask components is required. The FMF shall provide the capability to inspect and repair or replace, as necessary, all consumables and parts called out in each transportation cask's SAR and procedures. [10 CFR 961.11, Art IV B.2] [CRD 3.3.2.F]

K. Cask Reconfigurations

1. The FMF shall have the capability to remove and install fuel assembly baskets for those casks that have removable baskets. [CRD 3.2.1.E]

2. The FMF shall have the capability to remove and install fuel spacers in casks. [CRD 3.2.1.E]

3. The FMF shall have the capability to store empty casks individually and on their transportation conveyances. [CRD 3.2.1.E]

L. Tool and Spare Parts Storage

1. The FMF shall have the capability to store tools and fixtures, campaign kits, and ancillary equipment for casks that have moderate amounts of removable contamination. [10 CFR 71.127] [CRD 3.3.2.B]

2. The FMF shall have the capability to identify and control materials, parts, components, tools, and ancillary equipment for transportation cask systems in accordance with 10 CFR 71. [10 CFR 71.127] [CRD 3.3.2.B]

M. The FMF shall have the capability of evaluating damaged or degraded casks for continued operability, and to prepare the cask for decommissioning and disposal. [CRD 3.3.2.B]

N. Ventilation systems and off-gas systems shall be provided where necessary to ensure the confinement of airborne radioactive particulate materials during normal or off-normal conditions. [CRD 3.3.2.D]

O. The FMF shall have the capability to service security escort railcars. [CRD 1.3.2]

3.5.2 Intermodal Transfer Facility

TBD (October 2005)

3.5.3 Other Support Facilities

TBD (October 2005)

3.6 OPERATIONS REQUIREMENTS

This section defines the requirements to plan, operate, and maintain the operational transportation systems (including safeguards and security) necessary to support the overall OCRWM mission. This section addresses facilities and hardware that support receipt, handling, loading, and shipping preparations. Also included is support for normal and incident response for in-transit operations. The requirements in this section are in addition to and supplement the requirements specified in 3.2, Transportation Programmatic Requirements.

3.6.1 Characteristics

3.6.1.1 Normal Operations

A. Shipments of loaded and unloaded transportation casks shall be conducted in accordance with 49 CFR 173 and 10 CFR 71. [49 CFR 173.401] [DOE Order 460.2] [CRD 3.3.2.B] [CRD 3.3.2.C] [CRD 3.3.2.D]

B. Transportation cask systems (cask and transporter) and their motive support equipment shall conform to Federal, State and local laws, regulations, and ordinances

and approved rail carrier operating rules relating to weight and size limitations. [AAR Interchange Rule] [DOE Order 460.2] [CRD 3.2.1.J] [CRD 3.3.2.D]

C. Transportation cask systems shall be designed so that the SNF and HLW can be handled and transported in accordance with 10 CFR 71, 49 CFR 171-174, and 49 CFR 176-178, as applicable. [10 CFR 71.5] [49 CFR 171.2(b)] [49 CFR 176] [49 CFR 177] [49 CFR 178] [CRD 3.2.1.E] [CRD 3.3.2.B] [CRD 3.3.2.C]

D. A process shall be implemented that will identify, describe, and specify interface requirements between Transportation and other CRWMS segments, and entities external to the CRWMS regarding the transportation of SNF and HLW. [IICD] [CRD 3.1.1.C] [CRD 3.2.1.G] [CRD 3.3.2.D]

3.6.1.2 Radiological Protection

A. Personnel Protection

1. Radiation levels in positions normally occupied by personnel in the vehicle or carrier shall not exceed 2 millirem/hour. [10 CFR 71.47(d)] [49 CFR 177.842(g)] [CRD 3.3.2.B] [CRD 3.3.2.C]

2. Except as noted below, radiation levels at the surface of the loaded cask shall not exceed 200 millirem per hour and 10 millirem per hour at a distance of one meter from the external surface of the cask.

   For casks in “closed-transport” vehicles that have accompanying written “exclusive-use” of vehicle instructions, the dose rate shall not exceed 1,000 millirem per hour, 200 millirem per hour at the surface of the vehicle, and 10 millirem per hour at a distance of two meters from the edge of the transport conveyance as specified in 49 CFR 173.441(b). [49 CFR 173.441(b)] [CRD 3.3.2.C]

B. Radiation Monitoring

1. The capability shall be provided to monitor the external surfaces of transportation cask systems and support equipment for radioactive contamination and radiation levels in compliance with 10 CFR 71.47, 10 CFR 71.87(i), and 49 CFR 173.443(a). [10 CFR 71.47] [10 CFR 71.87(i)] [49 CFR 173.443(a)] [CRD 3.3.2.B] [CRD 3.3.2.C]

2. Transportation Operations shall be capable of surveying each vehicle transporting casks with radiation instruments after each use to confirm that the limits of 49 CFR 177.843 for highway transport, 49 CFR 174.715 for railway transport, and 49 CFR 176.715 for transport by vessel are not exceeded. [10 CFR 71.5(a)(2)] [49 CFR 174.715(a)] [49 CFR 176.715(a)] [49 CFR 177.843(a)] [CRD 3.3.2.B] [CRD 3.3.2.C]

C. Transportation Protection

1. Transportation Operations shall comply with the regulatory requirements for the packaging and transportation of radioactive material contained in 10 CFR 71 and 49 CFR 173. [10 CFR 71.0(c)] [49 CFR 173(a)] [CRD 3.3.2.B] [CRD 3.3.2.C]

2. Transport of SNF and HLW shall be in compliance with applicable DOT regulations. [NWPA 42 USC §10157(a)(1)] [CRD 3.3.2.C]

3.6.1.3 Functional Interfaces

A. Interfaces shall be developed and maintained to support shipment tracking, security, monitoring, and emergency response functions. This interfacing shall address communications systems, equipment, procedures, and resources. [DOE Order 151.1] [IICD] [CRD 3.3.2.D]

B. Transportation Operations shall maintain contamination levels for the interior of the transportation casks in accordance with 49 CFR 173. However, negotiations by Waste Acceptance with the Purchaser/ Producer/Custodian, may establish more stringent cleanliness requirements for the interior of the transportation cask for the beginning of each shipping campaign. [49 CFR 173] [CRD 3.3.2.C]

C. Prior to transportation, tamper-indicating devices or features shall be intact and operational. [10 CFR 71.43(b)] [CRD 3.3.2.B]

D. Transportation Operations shall have the capability to visually inspect and test loaded cask(s) prior to shipment from the Purchaser/Producer/Custodian site as necessary and appropriate to show compliance with 10 CFR 71 Subpart G. [10 CFR 71.87] [10 CFR 71, Subpart G] [10 CFR 71.93(b)] [10 CFR 961.11, Art IV.A.2(a)] [CRD 3.3.2.B]

E. During cask loading and prior to acceptance for transportation to a CRWMS facility, Transportation Operations shall have the capability to verify that the SNF or the HLW is properly loaded and packaged in accordance with the transportation cask Certificate of Compliance and is properly marked, labeled, and ready for transportation (including appropriate shipping documents) in accordance with applicable DOT regulations and OCRWM-established procedures. [10 CFR 961.11, Art VI.B.2] [CRD 3.3.2.F]

F. When the isotopic abundance, mass, concentration, degree of irradiation, degree of moderation, or other pertinent property of fissile material in any package is not known by the Purchaser/Producer/Custodian, Transportation Operations working with Waste Acceptance shall have the capability to ensure that the Purchaser/ Producer/Custodian packages the fissile material as if the unknown properties have credible values that will cause the maximum nuclear reactivity. [10 CFR 71.83] [CRD 3.3.2.B]

G. Transportation Operations shall have the capability to provide the Purchaser/Producer/Custodian appropriate equipment including, but not limited to, special tools, lifting trunnions, spare parts, and consumables needed to use and perform incidental maintenance on the cask(s) as part of a campaign kit, delivered in sufficient time to enable proper Transportation cask system loading. [10 CFR 961.11, Art IV.B.2] [CRD 3.3.2.F]

H. Transportation Operations shall work with Waste Acceptance when negotiations with, or transfer of information to, the Purchaser/Producer/Custodian is required. [CRD 3.3.1.C].

I. Written procedures and training material for personnel in handling, inspection, loading, cleaning, decontamination, and incidental maintenance of Transportation cask systems shall be provided to CRWMS and Purchaser/Producer/Custodian facilities in sufficient time prior to loading or unloading operations for the development of site-specific procedures. [10 CFR 961.11, Art IV.B.2] [DOE Order 414.1] [CRD 3.3.2.D] [CRD 3.3.2.F]

3.6.1.4 Labeling of Transportation Casks

A. Marking and labeling shall be in accordance with 49 CFR 172, Subpart D, 172.400 through 172.407, and 172.436 through 172.440. [10 CFR 71.5(a)(1)(ii)] [49 CFR 172, Subpart D] [CRD 3.3.2.C]

B. Placarding shall be in accordance with 49 CFR 172, 172.500 through 172.519, 172.556 and Appendices B and C. [10 CFR 71.5(a)(1)(iii)] [49 CFR 172] [CRD 3.3.2.B] [CRD 3.3.2.C]

C. Each transportation cask shall be conspicuously and durably marked with its model and serial number, gross weight, and package identification number assigned by the NRC. [10 CFR 71.85(c)] [CRD 3.3.2.B]

3.6.1.5 Physical Security/Escort Equipment

A. A safeguards and security plan shall be established, implemented, and maintained for shipments of SNF/HLW that will:

1. Minimize the potential for radiological sabotage by providing early detection and assessment of attempts to gain unauthorized access,
2. Facilitate location and recovery of shipments that may have come under the control of unauthorized persons,
3. Provide rapid notification to emergency response authorities in the event of sabotage attempts, and
4. Impede sabotage attempts until response forces arrive.

[49 CFR 172.802] [49 CFR 173.22(c)] [CRD 3.1.2.F] [CRD 3.3.2.C]

B. Escort equipment shall be provided that ensures capability to comply with all requirements of transportation security plans for shipments of SNF/HLW required by 49 CFR 397. [49 CFR 173.22] [49 CFR 397] [CRD 3.3.2.C]

C. Escorts shall be provided with equipment that permits the earliest practical notification to Transportation's in-transit status center and to appropriate Federal authorities of off-normal incidents involving SNF/HLW shipments. [49 CFR 171.15(a),(b)] [CRD 3.3.2.C]

D. For shipments by road, escort communication equipment shall provide the capability of two-way communication between the following parties: truck driver, communications center, local law enforcement agencies, and other escort(s). [CRD 3.3.2.C]

E. For SNF/HLW shipments by rail or vessel, a radio, telephone, or other approved equivalent means of two-way voice communication shall be available on the train or vessel. [33 CFR 104] [49 CFR 173.22] [CRD 3.3.2.C]

F. Security/escort equipment shall be designed, fabricated, tested, and inspected considering regulatory guidance and the requirements of applicable national standards, such as NRC Regulatory Guide 5.32 for escort communication equipment, NUREG-0561 for physical protection of SNF shipment, and ANSI N14.24 for domestic barge shipment of highway route controlled quantities of radioactive materials on inland waterways and in coastwise and ocean service. [QARD Sect. 3.2.1] [CRD 3.2.1.J]

G. Training and equipment necessary for escorts of radioactive material shipments shall be provided as required to comply with the requirements of 49 CFR 173.22. [49 CFR 173.22] [CRD 3.3.2.C]

3.6.1.6 Carrier Services/Motive Support Equipment

A. Unless specifically provided in 49 CFR 171-177, each carrier by rail, including a connecting carrier, shall perform the duties specified and comply with each applicable requirement of 49 CFR 174, and must instruct its employees in these requirements. [49 CFR 171] [49 CFR 172] [49 CFR 173] [49 CFR 175] [49 CFR 176] [49 CFR 177] [49 CFR 174.9] [CRD 3.3.2.C]

B. Each SNF and HLW shipment in loading and storage areas shall be segregated by a distance of at least 6 meters (20 feet) from other packages labeled "Radioactive" as described in 49 CFR 172.403. [49 CFR 172.403] [49 CFR 174.700(d)] [CRD 3.3.2.C]

C. Unless specifically provided in 49 CFR 171-177, each carrier by vessel, including a connecting carrier, shall perform the duties specified and comply with each applicable requirement of 49 CFR 176, and must instruct its employees in these requirements. [49 CFR 171] [49 CFR 172] [49 CFR 173] [49 CFR 174] [49 CFR 175] [49 CFR 176.13] [49 CFR 177] [CRD 3.3.2.C]

D. Motor carriers and other persons subject to 49 CFR 177 shall comply with 49 CFR Parts 390-397 to the extent those rules apply. [49 CFR 177.804] [49 CFR 390] [49 CFR 391] [49 CFR 392] [49 CFR 393] [49 CFR 394] [49 CFR 395] [49 CFR 396] [49 CFR 397] [CRD 3.3.2.C]

E. No truck or hauling vehicle shall be driven unless the parts and accessories are in good working order as required by 49 CFR 392.7. [49 CFR 392.7] [CRD 3.3.2.C]

F. No truck or hauling vehicle shall be driven unless the emergency equipment required by 49 CFR 393.95 is in place and ready for use. [49 CFR 392.8] [49 CFR 393.95] [CRD 3.3.2.C]

G. Motive support equipment shall be designed, fabricated, tested, and inspected considering the requirements of applicable national standards, such as ANSI N 14.24 for domestic barge shipment of highway route controlled quantities of radioactive materials on inland waterways and in coastwise and ocean service. [QARD Sect. 3.2.1] [CRD 3.2.1.J]

3.6.2 Design and Construction

3.6.2.1 Computer Systems and Software

A. Transportation Operations computer hardware and software systems shall provide for the inter-compatibility of computer hardware with other CRWMS functional areas. The goal is to allow for the common use of databases and information. [CRD 3.2.1.G]

B. The computer hardware/software shall be capable of interfacing directly with the computerized DOE Occurrence Reporting and Processing System. [DOE Order 231.1] [CRD 3.3.2.C] [CRD 3.3.2.D]

3.6.2.2 Equipment and Facility Interfaces

A. Transportation equipment shall be compatible with the queuing areas for loaded and unloaded casks, consistent with the expected cask receipt and shipment rates to include each cask type's spatial requirements while awaiting access or shipment. [49 CFR 174.700(d)] [49 CFR 177.842(f)] [CRD 3.2.1.E]

B. Access shall be provided to enable receipt inspections of transportation cask systems at the CRWMS facilities to determine external radiation levels and surface contamination levels. [DOE Order 460.2] [CRD 3.3.2.D]

C. Transportation equipment shall be compatible with the receiving (including washdown and external decontamination), handling, unloading, loading, shipping, equipment, and operations of CRWMS facilities. [10 CFR 71.43(b),(c),(e),(f),(g)] [10 CFR 71.47] [10 CFR 71.51] [10 CFR 71.87(a),(c),(e),(f),(g),(i),(2)] [10 CFR 961.11, Art IV.B.2] [CRD 3.3.2.B]

D. Transportation facilities and equipment collocated with other CRWMS facilities shall be compatible with the site features (drainage, acreage, roads, etc.). [DOE Order 430.1] [CRD 3.1.1.C] [CRD 3.3.2.D]

E. Transportation facilities and equipment (including service and maintenance support) collocated with other CRWMS facilities shall be compatible with the site utilities hardware and services. [DOE Order 430.1] [CRD 3.3.2.D]

F. Transportation facilities shall incorporate integral security systems into building design that are compatible with systems, equipment, and policies of any collocated facilities which control access to all site locations. [DOE Order 413.3] [CRD 3.1.2.F] [CRD 3.3.2.D]

G. Transportation shall have compatible communications for direct interaction with all CRWMS facilities and operations. [DOE Order 460.2] [CRD 3.1.1.C] [CRD 3.2.1.G] [CRD 3.3.2.D]

H. Transportation equipment and facilities shall be equipped with communication equipment to ensure compatibility with other CRWMS facilities. [DOE Order 460.2] [CRD 3.1.1.C] [CRD 3.2.1.G] [CRD 3.3.2.D]

I. The Transportation facilities and equipment shall be functionally compatible with facilities serviced, including the site improvements, utility services, security facilities, cask handling and site-generated radioactive waste systems, site vehicles, and administrative and warehouse facilities. [CRD 3.1.1.C] [CRD 3.2.1.G]

J. Transportation Operations emergency and campaign support vehicles shall be compatible for use with the access roads and railways provided at CRWMS sites serviced. [CRD 3.1.1.C] [CRD 3.2.1.G]

3.6.3 Documentation

A. Transportation Operations – Purchaser/Producer/Custodian

The requirements below pertain to the transfer of information between Transportation Operations and the Purchaser/Producer/Custodian. The information is necessary to define receipt rates for campaign planning and preparation, as well as for material control and accountability.

1. Transportation Operations shall have the capability to provide information about the appropriately configured Transportation cask system(s) which include(s) an NRC-certified cask with the equipment required to enable a Purchaser/Producer/Custodian to utilize the cask system(s), and necessary services to move the SNF and/or HLW from the Purchaser/Producer/Custodian site to the CRWMS facility. [10 CFR 961.11, Art IV.B.2] [CRD 3.3.2.F]

2. Transportation Operations shall, with the assistance of the Purchaser/Producer/Custodian, identify, document, and plan the site interface

capabilities. Negotiations with each Purchaser/Producer/Custodian may be necessary to determine if special equipment or facility modifications are needed to satisfy the site interface constraints. To the extent practicable, equipment already owned by the Purchaser/Producer/Custodian shall be used to meet site interface requirements. [10 CFR 961.11, Art IV.B.2] [CRD 3.3.2.F]

B. Maintenance, Operators, and Technical Manuals

Applicable regulatory requirements, design basis requirements, including cask SARs as referenced in the application for a Certificate of Compliance, and other requirements as specified herein shall be correctly translated into procedures and instructions, including training, operator, maintenance, and other technical manuals. [10 CFR 71.107] [CRD 3.3.2.B]

C. Test Plans and Procedures

Transportation shall establish a test program and procedures to assure testing is performed to demonstrate that the packaging equipment and components will perform satisfactorily in service. [10 CFR 71.123] [QARD, Sect. 11] [CRD 3.3.2.B]

3.6.4 Logistics

A. Transportation cask systems shall be provided to each Purchaser/Producer/Custodian site sufficiently in advance to accommodate scheduled deliveries, training and familiarization, and transportation from the site. [10 CFR 961.11, Art IV.B.2] [CRD 3.3.2.F]

B. Maintenance facilities, equipment, and tools shall be provided based on the criteria specified by DOE Order 433.1 [DOE Order 433.1] [CRD 3.3.2.D]

3.6.5 Communications Equipment

A. A 24-hour emergency response telephone shall be provided for use in emergencies involving the transportation of SNF or HLW as required by 49 CFR 172.604(a),(b). [49 CFR 172.604(a),(b)] [CRD 3.3.2.C]

B. Communication equipment shall be provided to notify the appropriate governor(s) (or designee(s)) prior to transporting SNF/HLW within or through the jurisdictions of States or Tribes. [10 CFR 71.97] [NWPA 42 USC §10175(b)] [CRD 3.3.2.A] [CRD 3.3.2.B]

3.6.6 Emergency Response

A. Transportation Operations shall comply with the requirements in 49 CFR 172 Subpart G for providing and maintaining emergency response information for off-normal events. [49 CFR 172.600] [49 CFR 172, Subpart G] [CRD 3.3.2.C]

B. Transportation Operations shall ensure that emergency response information conforming to 49 CFR 172 Subpart G (Sections 172.600.604) is immediately available for use at all times with the SNF and HLW and is immediately available to any person who, as an authorized representative of a Federal, State or local government agency, responds to an incident involving SNF/HLW, or is conducting an investigation that involves SNF/HLW. [49 CFR 172.600(c)] [49 CFR 172, Subpart G] [CRD 3.3.2.C]

C. Transportation Operations shall ensure that emergency response information (i.e., information that can be used in the mitigation of an incident involving SNF and HLW) that accompanies each SNF and HLW shipment conforms in content and form to 49 CFR 172.602(a),(b),(c). [49 CFR 172.602(a),(b),(c)] [CRD 3.3.2.C]

D. With all SNF and HLW shipments, Transportation Operations shall provide a 24-hour emergency response telephone number that is monitored at all times. The telephone number will be of a person who is either knowledgeable of the hazards and characteristics of the SNF and HLW being shipped and has comprehensive emergency response and incident mitigation information for that material, or has immediate access to a person who possesses such knowledge and information. [49 CFR 172.604(a)(1),(a)(2)] [CRD 3.3.2.C]

E. Cask recovery equipment shall be designed, fabricated, tested, and inspected considering the requirements of applicable national standards, such as ANSI N14.27 for emergency response to highway or rail transportation accidents. [DOE Order 252.1] [QARD Sect. 3.2.1] [CRD 3.2.1.J] [CRD 3.3.2.D]

3.6.7 Transportation Operations Training Equipment

Transportation Operations equipment and operating instructions shall be provided as necessary for training Purchaser/Producer/Custodian personnel in transportation cask handling and loading prior to each shipping campaign. [10 CFR 961.11, Art IV.B.2(b)] [CRD 3.3.2.F]

3.6.8 Personnel and Training

3.6.8.1 Personnel

Operations of systems and components that have been identified as quality affecting in a SAR or in a license or certificate shall be performed only by trained and certified personnel or by personnel under the direct visual supervision of an individual with training and certification in such operation. Supervisory personnel who direct operations that are important to safety must also be certified in such operations. [10 CFR 71.105(d)] [QARD Sect. 2.2.12] [CRD 3.3.2.B]

3.6.8.2 Training

A. General Requirement

1. Transportation Operations shall provide facilities and equipment necessary to support or conduct training for the operation and maintenance of facilities, hardware, and software procured or developed for Transportation. Training will address, at a minimum, the following subjects: (1) equipment required for training purposes; (2) training devices to be developed, their characteristics, and training and skills to be developed through their use; and (3) other matters such as schedules, source materials, and training aids to ensure a comprehensive program. [10 CFR 71.105(d)] [DOE Order 414.1] [DOE Order 420.1] [CRD 3.3.2.B] [CRD 3.3.2.D]

2. Transportation equipment maintenance training shall be provided based on the criteria specified by DOE Order 433.1. [DOE Order 433.1] [CRD 3.3.2.D]

3. Transportation Operations shall establish programs and facilities for training, proficiency testing, certification and recertification of personnel. [10 CFR 71.105(d)] [CRD 3.3.2.B]

4. Any person (including drivers, train crews, and other carrier personnel) who in the course of employment directly affects hazardous materials transportation safety shall be fully trained in accordance with the requirements of 49 CFR 172 Subpart H and 49 CFR 177.816, and, for nuclear materials, 49 CFR 397.101(e)(1). [49 CFR 172.702(b)] [49 CFR 172, Subpart H] [49 CFR 177.800(a)] [49 CFR 397.101(e)(1)] [CRD 3.3.2.C]

5. Transportation Operations shall provide the training of personnel in accordance with DOE Order 231.1. [DOE Order 231.1] [CRD 3.3.2.D]

B. Health Physics Training

Transportation shall provide a program for training, proficiency testing, and certification of personnel in radiation protection (health physics) and ALARA in accordance with DOE-STD-1098-99. [DOE-STD-1098-99] [CRD 3.3.2.D]

C. Occupational Safety and Health Training

Transportation Operations shall provide appropriate job related safety and health training including training as required under 29 CFR 1910.120. [29 CFR 1910.120(e)(1)(i)] [DOE Order 440.1] [CRD 3.1.2.C] [CRD 3.3.2.D]

3.6.9 Quality Assurance

A. In addition to the QA requirements specified in Section 3.2.8, the following requirements apply to Transportation operations:

1. Tools, gauges, instruments, and other measuring and testing devices used in activities affecting quality shall be properly controlled, calibrated, and adjusted in accordance with applicable portions of the QA program, the manufacturer's standards/ requirements, and industry standards to maintain accuracy within necessary limits. [10 CFR 71.125] [QARD Sect. 12] [CRD 3.3.2.B]

2. The storage of parts and material used in packaging shall provide for the control of these parts and material, to prevent damage and deterioration, and to maintain tracking of parts with documentary evidence. [10 CFR 71.115(b)] [10 CFR 71.127] [CRD3.3.2.B]

3.7 INSTITUTIONAL REQUIREMENTS

This section identifies the requirements for institutional interactions with industry, States, Tribes, and local governments in support of the OCRWM mission. This includes implementation of NWPA §180(c), which requires DOE to provide technical assistance and funds for training of local and Tribal public safety officials where SNF or HLW will be transported. The requirements in this section supplement the requirements specified in 3.2, Transportation Programmatic Requirements and 3.6, Operations Requirements. Transportation Operations identifies requirements for facilities, communication, training, and emergency response that will also support the Institutional sub-element.

3.7.1 Interface and Communication

A. Design, construction, and operations requirements addressing interfaces between Transportation and Federal agencies, State and local governments, Indian Tribes, law enforcement agencies, emergency response organizations, and private industry will be established by the responsible project offices. Such requirements will be consistent with memoranda of agreement such as the MOU between DOT/RW or similar project documentation establishing interface agreements. [MOU DOT/RW] [CRD 3.3.1.B]

B. Transportation shall abide by NRC regulations regarding advance notification of State and local governments prior to transportation of spent nuclear fuel or high-level radioactive waste under subtitle A or C of the NWPA. [NWPA 42 USC §10175(b)] [CRD 3.2.2.A]

C. Transportation will prepare a communications and outreach plan describing how it will communicate and interact with State, Tribal, and local government officials, regional cooperative agreement groups, local civic organizations, the public, and the media. DOE will provide the proposed plan to appropriate parties along the transportation routes and seek their comments. [DOE Order 460.2] [CRD 3.3.2.D]

3.7.2 Technical Assistance and Training

A. Transportation Operations shall provide technical assistance and funding for training public safety officials of local governments and Indian Tribes through whose jurisdiction SNF and HLW will be shipped. Training must cover procedures required for safe routine transportation of SNF and HLW and procedures for dealing with emergency response situations. [NWPA 42 USC §10175(c)] [10 CFR 961.11, Art IV.B.2] [CRD 3.3.2.A] [CRD 3.3.2.F]

3.8 NEVADA RAIL REQUIREMENTS

This section defines the requirements for a transportation infrastructure in Nevada that will support the OCRWM mission to deliver SNF and HLW to Yucca Mountain. This includes a railway line from a mainline railroad in Nevada to the Repository site. The functions of the Nevada rail line will be to:

- Move loaded rail casks, buffer cars, and escort cars from the mainline railroad to the Repository and the FMF;

- Move unloaded rail casks from the Repository to the FMF, and the unloaded rail casks, buffer cars, and escort cars from the FMF to the mainline railroad for delivery to a shipping site; and

- Move equipment and other commodities to the FMF and the Repository.

The infrastructure requirements also include the supporting work to assess the environmental impacts from the preferred route of the Nevada rail line as well as alternatives.

The Nevada Rail sub-element is subject to the requirements specified in 3.2, Transportation Programmatic Requirements and 3.6, Operations Requirements.

3.8.1 General

A. The Caliente Corridor and any variations outside the corridor identified during environmental analysis shall be used to examine potential Nevada rail alignments and profiles for construction of a rail line. [69 FR 18557] [69 FR 18565] [CRD 3.3.2.A]

B. The Nevada rail line shall be designed, constructed, and operated to transport railcars between a mainline junction near Caliente, Nevada and the Geologic Repository in a safe, secure, and efficient manner that both protects the health and safety of the public and of workers and maintains the quality of the environment. [CRD 1.3.1] [CRD 1.3.2]

C. The Nevada rail line shall be designed and constructed in accordance with appropriate regulatory, State, regional, or national codes including 49 CFR Subtitle B, Chapter II and Nevada Administrative Code (NAC) 705. [49 CFR, Subtitle B, Chapter II] [NAC 705] [CRD 3.1.1.G] [CRD 3.2.1.J] [CRD 3.3.2.C] [CRD 3.3.2.D]

3.8.2 Nevada Rail Performance Requirements

A. Nevada rail line clearances shall be planned, designed, and constructed to accommodate all rail car types and loads that the mainline railroad can deliver to the Nevada rail line junction near Caliente, Nevada. [CRD 3.3.2.E] [Repository FEIS 6.1.3]

B. The design, construction, operation, and maintenance of the Nevada rail line shall make provision for non-normal and peaking effects in the movements of loaded and empty casks. [CRD 3.2.1.A] [CRD 3.2.1.C] [CRD 3.2.1.E] [CRD 3.2.1.G]

C. The Nevada rail line shall be planned, designed, and constructed on the basis that maintenance-of-way will be accomplished using on-track equipment in lieu of road equipment using a parallel service road. [CRD 3.2.1.J]

3.8.3 Nevada Rail Design and Construction

3.8.3.1 Overall Design Requirements

A. Nevada rail track geometry shall be designed to accommodate, to the maximum reasonable extent, the maximum recommended speed specified by AAR's Recommended Railroad Operating Practices for Transportation of Hazardous Materials, OT-55-D, in order to expedite transportation of loaded and unloaded casks between the mainline railroad near Caliente, Nevada and the Geologic Repository. [DOE Order 252.1] [CRD 3.2.1.J] [CRD 3.3.2.D] [AAR OT-55-D]

B. The Nevada rail line shall be designed and maintained in accordance with appropriate sections of the American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering. [DOE Order 252.1] [CRD 3.2.1.J] [CRD 3.3.2.D] [AREMA Manual for Railway Engineering]

C. The Nevada rail line shall be designed and constructed in accordance with appropriate AAR standards including:

- Field Manual of the AAR Interchange Rules,
- Office Manual of the AAR Interchange Rules, and
- AAR Manual of Standards and Recommended Practices.

[DOE Order 252.1] [CRD 3.3.2.D] [AAR Field Manual of Interchange Rules] [AAR Office Manual of Interchange Rules] [AAR MSRP]

3.9 INTERFACE REQUIREMENTS

This section identifies the key programmatic and physical interfaces associated with the Transportation system. Specific interface requirements related to operations are included in Section 3.6. Section 3.6.1.3 includes the interfaces involving interactions among the Transportation sub-elements and between Transportation, other CRWMS elements, and organizations external to CRWMS. Section 3.6.2 identifies physical interface requirements involving systems, equipment, and facilities.

At this phase in the development of the Transportation system, the most important interfaces involve Cask Systems. For the Transportation system to work as a whole, all of the elements of the Transportation system must support the transfer and movement of casks. Since all casks must be approved by the NRC, the rolling stock, maintenance, and other Transportation operations must interface with the NRC certified casks.

There are many other important interfaces within and external to ONT that will be identified as the Transportation system matures and more detailed requirements are identified.

Appendix B identifies the anticipated interfaces for the Transportation system. Table B-1 identifies most of the casks currently docketed or approved by the NRC for transportation of SNF. At this time, which specific cask models will be procured, is unknown. Once procurement decisions are made, specific measures to control the design interfaces between Cask Systems and other affected elements will be developed.

Table B-2 shows the interfaces at a high level for the Transportation sub-elements. The Department's prior work in addressing and resolving transportation issues provides a starting point for interfaces with stakeholders and involved organizations including other Federal entities such as the NRC, Department of Transportation, Department of Labor, and Nuclear Waste Technical Review Board. Interface organizations will be informed as the transportation planning process proceeds. Topics to be addressed as interface communications evolve include:

- Selection of transportation routes and modes
- Emergency response planning and training
- Safeguards and security
- Operational practices
- Communications and information access
- Waste packaging for transportation
- Worker protection, training, training standards, and qualifications.

3.9.1 Stakeholder Interactions

In addition to State and Tribal government officials, ONT recognizes that a wide spectrum of stakeholders, such as groups with special interests, rate payers, labor organizations, and nonprofit organizations are interested in how the Transportation system will be developed. While these groups do not share the responsibilities or obligations of State and Tribal officials, or the professional responsibilities of industry groups that are directly involved with shipments, they do serve an important role by articulating the views and concerns of their membership.

3.9.2 Waste Acceptance

The Transportation interface with the Waste Acceptance element includes appropriate activities necessary to meet legal, regulatory, and operational requirements for acceptance and transportation of SNF and HLW. These activities include waste information management, acceptance protocols, scheduling and notification, and security. Specific requirements for functional interfaces between the Transportation and Waste Acceptance elements are included in Section 3.6.1.3. System and equipment interfaces are included in Section 3.6.2.

3.9.3 Repository

The Transportation interface with the Repository element includes appropriate activities necessary to meet the operational requirements for transfer of SNF and HLW, such as scheduling, handling, and security. Key among these activities is the return of unloaded transportation casks on a predictable schedule for re-use and redeployment. Specific requirements for functional interfaces between the Transportation and Repository elements are included in Section 3.6.1.3. System and equipment interfaces are included in Section 3.6.2.

4.0 REQUIREMENT PERFORMANCE EVALUATION AND VERIFICATION

4.1 GENERAL

This section describes the methods that Transportation will use to demonstrate that requirements identified in this document are effectively implemented.

Verifying conformance with requirements is part of the test and evaluation process. This process includes the development of test plans and procedures. These plans and procedures will be developed and performed on all procured, constructed, and developed equipment, structures, and software consistent with their importance to safety. Implementation of these plans and procedures will provide test reports and inspection results that will be used as documentation of conformance verification.

To ensure that policies and programmatic requirements are being effectively implemented, the performance of each program element will be assessed and evaluated. Verifying and evaluating non-physical systems requires different tools than used to verify equipment or a physical item. Reviews and assessments will need to be planned and implemented at both the ONT Program level, as well as at the project level. Plans must include a method and rationale to implement the assessment chosen, and must specify the methods to be used to document and report the findings of the assessment. Documentation will provide an explanation of how the requirements allocated to each sub-element have been satisfied. The methods selected for conformance verification will be consistent with the Civilian Radioactive Waste Management Major System Management Policy.

4.2 METHODS

The methods of evaluation and verification to be used include:

Analysis. Analysis is the process of accumulating results and conclusions intended to verify that a requirement has been satisfied. Analytical verification of conformance may include compilation and interpretation of results of tests, demonstrations, and examinations of lower-level components of the system. Analysis may also include logical arguments, modeling, calculations, tradeoff studies, reports (design and/or tradeoff) and other relevant information to verify compliance with a requirement, when physical testing of a system is impracticable.

Examination. Examination is the process of conducting careful observation and inspection, without use of special laboratory appliances and procedures, to verify conformance to specified requirements. Examination is a relatively direct method, involving, at most, simple physical manipulation or measurement. It is generally non-destructive and does not necessarily involve operation of the system being evaluated.

Test. Test is the quantitative process whereby data is collected, under controlled conditions, to document the performance of a product with respect to a standard. Manipulation and analysis of data derived from testing is an integral part of the method. Special instrumentation

and scientific procedures are commonly employed. A test may be conducted in a laboratory or in the field (in situ).

Demonstration. Demonstration is the qualitative process of displaying or operating a system or item in or near its operational environment to verify conformance to requirements. It differs from testing in that it is generally a qualitative and direct determination of the performance of a function and is performed without special instrumentation or other special equipment.

Software Verification and Validation. Procedures will ensure that the development, maintenance, and acquisition of software is performed according to the direction and requirements established for each system.

Audits. Audits provide objective evaluation of work areas, quality affecting activities, processes, procedures, and instructions to determine compliance with, and the effectiveness of, the QA program.

Self-Assessments. These assessments are planned and performed against criteria selected by program element management, on a graded approach based on risk, high cost activities, and interfaces.

Surveillances. Surveillances provide observation of activities or review of documentation to evaluate compliance with approved procedures.

Reviews. Technical and design reviews will be conducted to assess conformance with system requirements at the program level and design requirements at the project level. Several types of reviews are involved:

- System Requirements Review – This review is conducted to ascertain progress in defining system requirements at Level 3 and below and to evaluate the technical adequacy of those requirements.

- System Design Review - Design reviews can take place at any time in the design process (i.e., conceptual, preliminary, detailed, As-built) to evaluate the system requirements for adequacy and risk or to verify and document conformance with design requirements.

- Key Decision Readiness Review - These reviews are conducted at the program level after design review (discussed above) and before key decision points. These reviews verify that: a) prerequisites and programmatic requirements for the start of the next design phase or acquisition activity have been completed; b) the current design or specifications conform to specified requirements; c) applicable QA controls and procedures have been developed and reviewed for adequacy and appropriateness; and d) facilities and other resources will be available on schedule.

In-Process Reviews - Where there are no key decisions or design points to evaluate, this review will provide management with the current project status and evaluation of project cost, schedule, and technical performance against the current baseline.

5.0 NOTES

5.1 GLOSSARY

As Low As is Reasonably Achievable (ALARA) means making every reasonable effort to maintain exposures to radiation as far below the dose limits in 10 CFR 20 as is practical consistent with the purpose for which the licensed activity is undertaken, taking into account the state of technology, the economics of improvements in relation to the state of technology, the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to utilization of nuclear energy and licensed materials in the public interest. (As defined in 10 CFR 20.1003)

Bare SNF is uncanistered, individual spent nuclear fuel assemblies.

Campaign is defined as the activities required to prepare for and execute a consecutive set of shipments from a given shipping (originating) site over a fixed period of time.

Canister is the structure surrounding the waste form (e.g., HLW immobilized in borosilicate glass) that facilitates handling, storage, transportation, and/or disposal. A canister is a metal receptacle with the following purpose: (1) for solidified HLW, its purpose is a pour mold and (2) for SNF, it may provide structural support for intact SNF, loose rods, nonfuel components, or containment of radionuclides.

Cask is a container for packaging of SNF and/or HLW that meets all applicable regulatory requirements. The following types of casks are utilized by the CRWMS:

- Single-Purpose Casks - These transportation casks are primarily intended for transporting uncanistered, standard, and nonstandard SNF from Purchaser/Custodian sites to a CRWMS site.

- Canister Casks - These transportation casks are for transporting canisters (MPC or DPC) containing SNF from Purchaser/Custodian sites to CRWMS sites and between CRWMS sites.

- Transportable Storage Casks (TSCs) - These transportation casks are for storing uncanistered SNF at Purchaser sites and for transporting SNF from Purchaser sites to CRWMS facilities.

- HLW Casks - These transportation casks are for transporting commercial and defense HLW from Producer sites to the Geologic Repository.

- Specialty Casks - These transportation casks are for transporting nonstandard SNF, and/or fuel related hardware, and/or failed fuel from Purchaser/Custodian sites to the Geologic Repository.

Certificate of Compliance (CoC) is a certificate approving for use, with identified limitations, a specific packaging for quantities of radioactive materials exceeding Al/A2 quantities as defined in 10 CFR 71 and 49 CFR 173. A CoC may be issued by the NRC, DOT, or DOE. As used in this document, CoC refers to a certificate issued by the NRC.

Civilian Radioactive Waste Management System (CRWMS) is the composite of sites, facilities, systems, equipment, materials, information, activities, and personnel required to perform those activities necessary to manage spent nuclear fuel and high-level radioactive waste disposal.

Commercial High-Level Radioactive Waste (CHLW) is the high-level radioactive waste, as defined by NWPA 42 USC §10101(12), resulting from reprocessing spent nuclear fuel in a commercial facility.

Custodian means any government agency that possesses spent nuclear fuel that is eligible for disposal in the CRWMS.

Custody denotes the point at which OCRWM assumes responsibility and control of SNF from the Purchaser. As specified in the Standard Contract found in 10 CFR 961, custody is transferred to DOE at the Purchaser's facility. For HLW, custody will be defined in an MOA between OCRWM and the Producers.

Decommission means to remove safely from service and reduce residual radioactivity to a level that permits: for land or facilities, release of the property for unrestricted use and termination of license; and for casks, release of the cask for appropriate disposal.

Dedicated train is a train that is dedicated to transporting a single commodity, such as loaded transportation casks during a given shipment regardless of any special conditions that may be placed on the train or the shipment.

Defense High-Level Radioactive Waste (DHLW) is the high-level radioactive waste, as defined by NWPA 42 USC §10101(12), resulting from reprocessing spent nuclear fuel in a defense facility.

Disposal means the emplacement of radioactive waste in a geologic repository with the intent of leaving it there permanently. (As defined in 10 CFR 63.2)

Function is a primary statement of purpose; it defines what a system or subsystem must accomplish to meet the system mission.

Functional interface is the interaction between functions, as in the flow of material or information between a sequence of activities.

Geologic Repository means a system that is intended to be used for, or may be used for, the disposal of radioactive wastes in excavated geologic media. A geologic repository includes the engineered barrier system and the portion of the geologic setting that provides isolation of the radioactive waste. (As defined in 10 CFR 63.2)

Heavy Haul is the process by which greater-than-legal-weight road shipments are transported. Such shipments are typically far in excess of the 40 ton legal-weight limit. Unlike rail or highway shipments, heavy haul transport need not cover a specially-surfaced transport pathway. Some portions of the transport path may be "off-road". The equipment utilized may include any combination of tractive force vehicles and equipment, including load cradles or trailers. Multiple axles are typically required to distribute the load, and each axle may be self-articulating and independently steerable.

High-Level Radioactive Waste (HLW) means (1) the highly radioactive material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and (2) other highly radioactive material that the Nuclear Regulatory Commission, consistent with existing law, determines by rule requires permanent isolation.

Legal-weight truck (LWT) is a truck cask subsystem, consisting of a tractor, semitrailer, and loaded cask, with a maximum gross weight of 80,000 pounds. Special permits are not required for LWT shipments.

Licensed material is source material, special nuclear material, or byproduct material received, possessed, used, transferred or disposed of under a general or specific license issued by the Nuclear Regulatory Commission. (As defined in 10 CFR 20.1003)

Licensee is a person who is authorized to conduct activities under a license or construction permit issued by the Nuclear Regulatory Commission. (As defined in 10 CFR 2.4)

Loaded means a cask or canister that (1) contains its intended complement of SNF assemblies, (2) the contents have been verified, and (3) has been closed and the DOE (OCRWM) approved tamper indicating seal is certified.

Maintainability is the measure of the ability to perform maintenance on an item, on which maintenance is performed by personnel having specified skill levels, using prescribed procedures and resources, at each prescribed level of maintenance and repair; that is, the ability of an item to be maintained.

Motive support equipment consists of the vehicle providing motive power to the transporter and other equipment needed to support movement of a transportation cask. Examples are locomotives, rail buffer cars, barges, cranes, heavy lift/haul tractors (trucks), and legal-weight trucks.

Nevada Rail – Those activities necessary to ensure that the transportation infrastructure in Nevada will support Transportation goals for the delivery of SNF and HLW to Yucca Mountain. This includes a railway line, supporting infrastructure, and supporting environmental work.

Off-normal occurrences are abnormal or unplanned events or conditions that adversely affect, potentially affect, or are indicative of degradation in, the safety, security, environmental or health protection performance or operation of a facility.

Overweight Truck (OWT) is a truck cask subsystem, consisting of a tractor, semitrailer, and loaded cask, with a gross vehicle weight in excess of 80,000 pounds, but not more than 90,000 to 105,000 pounds depending on the particular state transmitted. Each state will issue a permit based on individual weight computation formulas.

Owner is any person who has title to spent nuclear fuel or high-level radioactive waste. (As defined in 10 CFR 961.3)

Package is the packaging together with its radioactive contents as presented for transport. (As defined in 10 CFR 71.4)

Packaging is the assembly of components necessary to ensure compliance with packaging requirements of 10 CFR 71. It may consist of one or more receptacles, absorbent materials, spacing structures, thermal insulation, radiation shielding, and devices for cooling or absorbing mechanical shocks. The vehicle, tie-down system, and auxiliary equipment may be designated as part of the packaging. (As defined in 10 CFR 71.4)

Physical system means the Civilian Radioactive Waste Management System (CRWMS) consisting of the composite of the sites, and all facilities, systems, equipment, materials, information, activities, and the personnel required to perform those activities necessary to manage waste disposal.

Possession means the authority by a general NRC-issued license (e.g., carrier) to have or possess special nuclear material only, or the authority by a specific NRC-issued license (e.g., Purchaser, Geologic Repository) to have and to be held accountable for special nuclear material. Accountability transfers only between specific NRC licensees.

Producer is any generator of high-level radioactive waste resulting from atomic energy defense activities, nuclear fuel reprocessing, or any producer of vitrified commercial HLW.

Protected area is any area encompassed by physical barriers and to which access is controlled. (As defined in 10 CFR 73.2)

Purchaser is any person, other than a Federal agency, who is licensed by the Nuclear Regulatory Commission to use a utilization or production facility under the authority of Sections 103 or 104 of the Atomic Energy Act of 1954 (42 USC §2133, 2134), or who has title to SNF or HLW and who has executed a contract or other contractual agreement with DOE. Purchaser SNF includes Government-owned SNF from commercial industry and civilian development programs.

Radioactive mixed waste is waste containing both radioactive and hazardous components regulated by AEA and RCRA, respectively. The term "radioactive component" refers only to the actual radionuclides dispersed or suspended in the waste substance.

Radiological sabotage is any deliberate act directed against a site or transport in which an activity is conducted pursuant to the regulations in Title 10 of the Code of Federal Regulations, or against a component of such a site or transport, which could directly or indirectly endanger the public health and safety by exposure to radiation.

Repository is synonymous with Geologic Repository.

Requirement is a qualitative or quantitative statement of how well a function must be performed.

Rolling Stock consists of locomotives, cask cars, buffer cars, and escort cars used in rail transportation and does not include trucks or barges.

Safeguards system means an integrated system of physical protection, material accountability, and material control measures that will have capabilities for the protection (deter, prevent, detect, and respond) of special nuclear material (SNF and HLW) at fixed sites and in transit. In particular, it is a system designed to protect against acts of radiological sabotage and to prevent the theft of special nuclear material (SNF and HLW).

Shipment is the movement of the properly prepared (loaded, unloaded, or empty) cask from one site to another and all associated regulatory activities.

Source material means: (1) Uranium or thorium, or any combination thereof, in any physical or chemical form or (2) ores which contain by weight one-twentieth of one percent (0.05%) or more of: (i) Uranium, (ii) thorium or (iii) any combination thereof. Source material does not include special nuclear material. (As defined in 10 CFR 40.4)

Special nuclear material means (1) plutonium, uranium 233, uranium enriched in the isotope 233 or in the isotope 235, and any other material that the NRC, pursuant to the provisions of Section 51 of the Atomic Energy Act of 1954 as amended, determines to be special nuclear material (does not include source material); or (2) any material artificially enriched by any of the foregoing (does not include source material). (As defined in 10 CFR 70.4)

Spent nuclear fuel (SNF) is fuel that has been withdrawn from a nuclear reactor following irradiation, the constituent elements of which have not been separated by reprocessing. (As defined in NWPA 42 USC §10101(23) and 10 CFR 961.11).

System element is one of three major configuration items which are required to accomplish the functions of the CRWMS. The three system elements are Waste Acceptance, Transportation, and Geologic Repository. This differs from the "project" that may be initiated by DOE to manage and control development of one or more system elements (e.g., the Yucca Mountain Project).

To Be Determined (TBD) is used as a placeholder to identify information that is not yet defined.

Transportation cask is a container for shipping spent nuclear fuel and/or high-level radioactive waste that meets all applicable regulatory requirements.

Transporter is a cargo-carrying vehicle used for transportation of cargo. It includes semi-trailers, rail cars, intermodal transportation skids and equipment such as tie-down components, personnel barriers, etc., needed to make the loaded cargo-carrying vehicle transport-ready.

Unloaded transportation cask is a cask that has been used for transporting waste, but does not physically contain SNF or HLW. This term normally describes a cask that has had the waste

removed and may either be in contaminated or decontaminated condition. Decontaminated casks will still have residual contamination present.

Waste form is the radioactive waste materials and any encapsulating or stabilizing matrix. (As defined in 10 CFR 63.2)

Waste handling activities include receipt of waste, preparation of waste for storage or disposal, transfer of waste from one cask to another or to its place of emplacement, emplacement of waste, and retrieval of waste.

Waste package is the waste form and any containers, shielding, packing, and other absorbent materials immediately surrounding an individual waste container. (As defined in 10 CFR 63.2)

5.2 ACRONYMS AND ABBREVIATIONS

AAR	Association of American Railroads
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ACRI	Air Conditioning and Refrigeration Institute
AEA	Atomic Energy Act
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ALARA	As Low As is Reasonably Achievable
ANS	American Nuclear Society
ANSI	American National Standards Institute
AREA	American Railway Engineering Association
AREMA	American Railway Engineering and Maintenance-of-Way Association
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating Refrigerating and Air-conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATA	American Trucking Association
AWS	American Welding Society
BWR	Boiling water reactor
CFR	Code of Federal Regulations
CHLW	Commercial high-level radioactive waste
CoC	Certificate of Compliance
CRD	CRWMS Requirements Document
CRWMS	Civilian Radioactive Waste Management System
DHLW	Defense high-level radioactive waste
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EM	Office of Environmental Management (DOE)
EPA	U.S. Environmental Protection Agency
HLW	High-level radioactive waste
IAEA	International Atomic Energy Agency
IEEE	Institute of Electrical and Electronics Engineers
IMT	Intermodal transfer
LWT	Legal-weight truck
MOA	Memorandum of Agreement

MOU	Memorandum of Understanding
MTHM	Metric Ton(s) of Heavy Metal
NAC	Nevada Administrative Code
NAAMM	National Association of Architectural Metal Manufacturers
NAPHCC	National Association of Plumbing-Heating-Cooling Contractors
NCMA	National Concrete Masonry Association
NDE	Non-destructive examination
NEMA	National Electrical Manufacturers Association
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
NIST	National Institute of Standards and Technology
NRC	U.S. Nuclear Regulatory Commission
NUREG	Nuclear Regulatory Guideline
NWPA	Nuclear Waste Policy Act
OCRWM	Office of Civilian Radioactive Waste Management
OMB	Office of Management and Budget
OSHA	Occupational Safety and Health Act
OWT	Over weight truck
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute
P.L.	Public Law
PWR	Pressurized water reactor
QA	Quality assurance
QARD	Quality Assurance Requirements and Description
RAS	Requirements Analysis Sheet
RCRA	Resource Conservation and Recovery Act
RW	Office of Civilian Radioactive Waste Management (DOE)
SAR	Safety Analysis Report
SARA	Super Fund Amendments and Reauthorization Act
SSC	Systems, structures, and components
SNF	Spent Nuclear Fuel
TBD	To be determined
TSC	Transportation Storage Cask
USC	United States Code
VCS	Voluntary consensus standard
WASRD	Waste Acceptance System Requirements Document

Appendix A – Transportation Requirements Allocation and Traceability		
Requirement	**Requirement Allocation[1]**	**TSRD Occurrences**
42 USC §4321 et seq. National Environmental Policy Act (NEPA) of 1969 (P.L. 91-190)	Programmatic	3.2.3.B
42 USC §9601 et seq. Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) as amended by the Super Fund Amendments and Reauthorization Act (SARA) of 1986 (P.L. 99-499)	Programmatic	3.2.3.B
42 USC §10101 et seq. Nuclear Waste Policy Act of 1982, as amended	Programmatic	3.2.1.B; 3.2.1.J; 3.2.3.A.2; 3.3.1.A; 3.6.1.2.C.2; 3.6.5.B; 3.7.1.B; 3.7.2.A
42 USC §6901 et seq. Resource Conservation and Recovery Act	Programmatic	3.2.4.D
10 CFR 63 Disposal of high-level radioactive wastes in a geologic repository at Yucca Mountain, Nevada	Programmatic	3.2.1.K
10 CFR 71 Packaging and Transportation of Radioactive Material	Programmatic	3.2.1.F; 3.2.1.I; 3.2.1.K; 3.2.2.C.1; 3.2.2.C.3; 3.2.5; 3.2.8; 3.2.9.B; 3.3.2; 3.5.1.B; 3.5.1.D; 3.5.1.E; 3.5.1.F; 3.5.1.I.1; 3.5.1.L.1; 3.5.1.L.2; 3.6.1.1.C; 3.6.1.2.A.1; 3.6.1.2.B.1 3.6.1.2.B.2; 3.6.1.2.C.1; 3.6.1.3.C; 3.6.1.3.D; 3.6.1.3.F; 3.6.1.4.A; 3.6.1.4.B; 3.6.1.4.C; 3.6.2.2.C; 3.6.3.B; 3.6.3.C; 3.6.8.2.A.2; 3.6.8.1; 3.6.8.2.A.3; 3.6.9.A.1; 3.6.9.A.2
10 CFR 75 Safeguards on Nuclear Material-Implementation of US/IAEA Agreement	Programmatic	3.2.5
10 CFR 961 Standard Contract for Disposal of Spent Nuclear Fuel and/or High-Level Radioactive Waste	Programmatic	3.2.1.A; 3.3.1.A; 3.5.1.A; 3.5.1.B; 3.5.1.C; 3.5.1.F; 3.5.1.G.1; 3.5.1.H; 3.5.1.J; 3.6.1.3.D; 3.6.1.3.E; 3.6.1.3.G; 3.6.1.3.I; 3.6.2.2.C; 3.6.3.A.1; 3.6.3.A.2; 3.6.4.A; 3.6.7; 3.7.2.A
10 CFR 1021 National Environmental Policy Act Implementing Procedures Executive Order 11514, National Environmental Policy Act, Protection and Enhancement	Programmatic	3.2.3.B
29 CFR 1910 Occupational Safety and Health Standards	Programmatic	3.2.3.A.3; 3.6.8.2.C
29 CFR 1926 Safety and Health Regulations for Construction Work	Programmatic	3.2.3.A.5
29 CFR 1960 Basic Program Elements for Federal Employee Occupational Safety and Health Programs and Related Matters	Programmatic	3.2.3.A.3

[1] Requirements are allocated to the appropriate Transportation sub-element. Requirements that apply to more than one Transportation sub-element or to the Transportation system, overall, are considered Transportation programmatic requirements. Requirements have not been allocated to the Support Facilities or Institutional sub-elements since these requirements are TBD, pending DOE determination of appropriate requirements.

Appendix A – Transportation Requirements Allocation and Traceability		
Requirement	**Requirement Allocation[1]**	**TSRD Occurrences**
33 CFR 1 to 199 Coast Guard Department of Transportation	Programmatic	3.2.1.M; 3.6.1.5.E
40 CFR 243 Guidelines for the Storage and Collection of Residential, Commercial, and Institutional Solid Waste	Programmatic	3.2.4.B
40 CFR 246 Source Separation for Materials Recovery Guidelines	Programmatic	3.2.4.B
40 CFR 261 Identification and Listing of Hazardous Waste	Programmatic	3.2.4.C; 3.2.4.D
40 CFR 262 Standards Applicable to Generators of Hazardous Waste	Programmatic	3.2.4.C; 3.2.4.D
40 CFR 263 Standards Applicable to Transporters of Hazardous Waste	Programmatic	3.2.4.D
41 CFR 102-80.45 Safety and Environmental Management	Programmatic	3.2.3.A.4
41 CFR 109 Department of Energy Property Management Regulations	Programmatic	3.2.2.A.2
43 CFR 2300 Land Withdrawals	Programmatic	3.2.2.A.1
49 CFR 171 General Information, Regulations and Definitions	Programmatic	3.5.1.G.2; 3.6.1.1.C; 3.6.1.5.C; 3.6.1.6.A; 3.6.1.6.C, 3.6.5.B
49 CFR 172 Hazardous Materials Communications and Emergency Response Information Requirements	Programmatic	3.2.7.B; 3.5.1.G.2; 3.6.1.4.A; 3.6.1.4.B; 3.6.1.5.A; 3.6.1.6.A; 3.6.1.6.B; 3.6.1.6.C; 3.6.8.2.A.4; 3.6.5.A; 3.6.6.A; 3.6.6.B; 3.6.6.C; 3.6.6.D
49 CFR 173 Shippers—General Requirements for Shipments and Packagings	Programmatic	3.2.2.C.3; 3.2.6.A.1; 3.2.6.A.2; 3.5.1.G.1; 3.5.1.G.2; 3.5.1.I.1; 3.6.1.1.A; 3.6.1.2.A.2; 3.6.1.2.B.1; 3.6.1.2.C.1; 3.6.1.3.B; 3.6.1.5.A; 3.6.1.5.B; 3.6.1.5.E; 3.6.1.5.G; 3.6.1.6.A; 3.6.1.6.C
49 CFR 174 Carriage by Rail	Programmatic	3.4; 3.5.1.G.2; 3.6.1.2.B.2; 3.6.1.6.A; 3.6.1.6.B; 3.6.1.6.C; 3.6.2.2.A
49 CFR 176 Carriage by Vessel	Programmatic	3.5.1.G.2; 3.6.1.1.C; 3.6.1.2.B.2; 3.6.1.6.A; 3.6.1.6.C
49 CFR 177 Carriage by Public Highway	Programmatic	3.5.1.G.2; 3.6.1.1.C; 3.6.1.2.A.1; 3.6.1.2.B.2; 3.6.1.6.A; 3.6.1.6.C; 3.6.1.6.D; 3.6.8.2.A.4; 3.6.2.2.A
49 CFR 178 Shipping Container Specifications	Programmatic	3.5.1.G.2; 3.6.1.1.C
49 CFR, Subtitle B, Chapter II (200 – 299) Federal Railroad Administration (Selected Parts)	Nevada Rail	3.8.1.C

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Appendix A – Transportation Requirements Allocation and Traceability		
Requirement	**Requirement Allocation[1]**	**TSRD Occurrences**
49 CFR 350 – 399 Federal Motor Carrier Safety Regulations	Operations	3.6.1.5.B; 3.6.1.6.D; 3.6.1.6.E; 3.6.1.6.F; 3.6.8.2.A.4; 3.6.2.1.B
49 CFR 392 Driving of Motor Vehicles	Operations	3.6.1.6.D; 3.6.1.6.E; 3.6.1.6.F
49 CFR 397 Transportation of Hazardous Materials; Driving and Parking Rules	Operations	3.6.1.5.B; 3.6.1.6.D; 3.6.8.2.A.4
69 FR 18557 Record of Decision on Mode of Transportation and Nevada Rail Corridor for the Disposal of Spent Nuclear Fuel and High Level Radioactive Waste at Yucca Mountain, Nye County, NV	Nevada Rail	3.8.1.A
69 FR 18565 Notice of Intent to Prepare an Environmental Impact Statement for the Alignment, Construction, and Operation of a Rail Line to a Geologic Repository at Yucca Mountain, Nye County, NV	Nevada Rail	3.8.1.A
Presidential Memo Disposal of Defense Waste in a Commercial Repository (04/30/85)	Programmatic	3.2.1.A
DOE Order 151.1 Comprehensive Emergency Management System	Programmatic	3.2.7.A; 3.2.7.B; 3.6.1.3.A
DOE Order 200.1 Information Management Program	Programmatic	3.2.1.K
DOE Order 231.1 Environmental, Safety and Health Reporting	Programmatic	3.6.2.1.B; 3.6.8.2.A.5
DOE Order 252.1 Technical Standards Program	Programmatic	3.2.2.B.2; 3.2.2.C.4; 3.2.2.C.5; 3.4.1.A; 3.4.1.B.1; 3.4.1.B.2; 3.4.1.B.3; 3.4.1.B.4; 3.4.1.B.5; 3.4.2.C; 3.4.2.D; 3.6.6.E; 3.8.3.1.A; 3.8.3.1.B; 3.8.3.1.C
DOE Order 413.3 Program and Project Management for Acquisition of Capital Assets	Programmatic	3.2.1.H; 3.2.9.A; 3.2.9.D; 3.6.2.2.F
DOE Order 414.1 Quality Assurance	Programmatic	3.2.1.K; 3.2.8; 3.6.1.3.I; 3.6.8.2.A.1
DOE Order 420.1 Facility Safety	Programmatic	3.2.2.B.3; 3.2.2.B.4; 3.2.3.A.1; 3.2.3.A.4; 3.2.5; 3.2.6.A.1; 3.6.8.2.A.1
DOE Order 430.1 Real Property Asset Management	Programmatic	3.2.9.C; 3.2.9.D; 3.6.2.2.D; 3.6.2.2.E
DOE Order 430.2 Departmental Energy and Utilities Management	Programmatic	3.2.1.L
DOE Order 433.1 Maintenance Management Program for DOE Nuclear Facilities	Programmatic	3.2.1.G; 3.2.9.C; 3.6.8.2.A.2; 3.6.4.B

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Appendix A – Transportation Requirements Allocation and Traceability		
Requirement	**Requirement Allocation[1]**	**TSRD Occurrences**
DOE Order 435.1 Radioactive Waste Management	Programmatic	3.2.4.A
DOE Order 440.1 Worker Protection Management	Programmatic	3.6.8.2.C
DOE Order 450.1 Environmental Protection Program	Programmatic	3.2.3.B; 3.2.4.B
DOE Order 460.2 Materials Transportation and Packaging Management	Operations	3.2.5; 3.2.7.A; 3.6.1.1.A; 3.6.1.1.B; 3.6.2.2.B; 3.6.2.2.G; 3.6.2.2.H; 3.7.1.C
DOE-STD-1098-99 Radiological Control	Operations	3.6.8.2.B
CRD (DOE/RW-0406P) CRWMS Requirements Document (CRD)	Programmatic	All requirement sections.
EM/RW Memo to Under Secretary Dated December 19, 2003 Clarification of Roles and Responsibilities	Programmatic	3.3.1.C
IICD (DOE/RW-0511) Integrated Interface Control Document	Programmatic	3.2.2.C.6; 3.6.1.1.D; 3.6.1.3.A
QARD (DOE/RW-0333P) OCRWM Quality Assurance Requirements and Description (QARD)	Programmatic	3.2.1.F; 3.2.1.I; 3.2.1.K; 3.2.2.B.1; 3.2.2.C.2; 3.2.8; 3.2.9.B; 3.5.1.I.2; 3.6.1.5.F; 3.6.1.6.G; 3.6.3.C; 3.6.6.E; 3.6.8.1; 3.6.9.A.1
Repository FEIS (DOE/EIS-0250F) Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada	Programmatic	3.8.2.A
WASRD (DOE/RW-0351) Waste Acceptance System Requirements Document (WASRD)	Programmatic	3.2.1.A; 3.3.1.C
MOA EM/RW Memorandum of Agreement for Acceptance of DOE SNF and HLW, 1999	Programmatic	3.3.1.C
MOU DOT/RW Memorandum of Understanding for the Transportation of Radioactive Materials under the Nuclear Waste Policy Act	Programmatic	3.7.1.A
NAC 705 Nevada Administrative Code (NAC) 705, Railroads	Nevada Rail	3.8.1.C
AAR Interchange Association of American Railroads (AAR) Interchange Rule 91 Weight Limitations (AAR Interchange Rule 91)	Programmatic	3.6.1.1.B
AAR OT-55-D AAR Recommended Railroad Operating Practices for Transportation of Hazardous Materials	Nevada Rail	3.8.3.1.A

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Appendix A – Transportation Requirements Allocation and Traceability		
Requirement	**Requirement Allocation[1]**	**TSRD Occurrences**
AAR Standard M-1001	Rolling Stock	3.4.1.B.2
Applicable Standards in the AAR Manual of Standards and Recommended Practices (MSRP), Office Manual of the AAR Interchange Rules, and Field Manual of the AAR Interchange Rules	Rolling Stock/Nevada Rail (Programmatic)	3.4.1.B.1; 3.4.1.B.3; 3.4.1.B.4; 3.8.3.1.C
AREMA Manual for Railway Engineering American Railway Engineering and Maintenance-of-Way Association (AREMA), Manual for Railway Engineering	Rolling Stock/Nevada Rail (Programmatic)	3.4.2.C; 3.4.2.D; 3.8.3.1.B

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Appendix B – Anticipated Interfaces

Appendix B identifies the anticipated interfaces for the Transportation system. Table B-1 identifies some of the casks currently docketed or approved by the NRC for the transportation of Spent Nuclear Fuel. This table is not an exhaustive list but is used to show some of the existing cask models, vendors, and the associated NRC Certificates of Compliance. At this time, which specific cask models will be procured is unknown. Until these procurement decisions are made, any preliminary or conceptual designs for systems, structures, or components that will interface with transportation casks must be designed so that the design will not preclude the use of any of these existing designs. Once procurement decisions are made, specific measures to control the design interfaces between Cask Systems and other affected elements will be developed.

Table B-1. List of Casks Currently Docketed or Approved by NRC

Model (Type)	Vendor	CoC
GA-4 (Truck)	General Atomics	9226
GA-9 (Truck)	General Atomics	9221
NAC-LWT (Truck)	NAC International, Inc.	9225
NAC-STC (Rail)	NAC International, Inc.	9235
UMS Universal Transport (Rail)	NAC International, Inc.	9270
MP-187 Multi-Purpose Cask (Rail)	Transnuclear, Inc.	9255
TN-68 (Rail)	Transnuclear, Inc.	9293
HI-STAR 100 (Rail)	HOLTEC International	9261
TranStor (Rail)	BNFL Fuel Solutions	9268

Table B-2. Key Programmatic Interfaces Associated with the Transportation System

Program and Project Management	Cask Systems	Rolling Stock	Fleet Support Facilities	Operations	Institutional	Nevada Rail	Transportation System Sub-elements
Stakeholder Interactions							
√			√	√	√	√	• States and Tribes
√			√	√	√	√	• Emergency Responders
√	√	√	√	√	√	√	• Special Interest Groups
√	√	√	√	√	√	√	• Transportation Industry
√	√	√	√	√	√	√	• Utilities
√	√	√	√	√	√	√	• Public
Waste Acceptance							
							• Standard Contract
√				√			➢ Disposal Allocations
√	√	√		√			➢ Waste Specifications
√	√	√		√			➢ Waste Acceptance Criteria/Data
√	√	√	√	√		√	➢ Roles and Responsibilities
√	√	√		√			➢ Waste Generator Information Mgt.
							• Utilities
√	√	√		√			➢ Utility Storage Facility Interfaces
√	√	√		√			➢ Site Limitations
√	√	√		√			➢ Service Needs
√	√	√		√			➢ Mode Preferences
√	√	√		√			➢ Waste Information Management
√	√	√	√	√			➢ Scheduling
							• DOE Sites
√	√	√		√			➢ Storage Facility Interfaces
√	√	√		√			➢ Site Limitations
√	√	√	√	√			➢ Service Needs
√	√	√	√	√			➢ Mode Preferences
√	√	√		√			➢ Waste Information Management
√	√	√	√	√			➢ Scheduling
Repository							
							• Cask Receiving
√	√	√	√	√		√	➢ Cask Systems Envelopes
√	√	√	√	√		√	➢ Cask Handling Interfaces
√	√	√	√	√		√	➢ Operating Constraints
√	√	√	√	√		√	➢ Vehicle Interfaces
√	√	√	√	√		√	➢ Fleet Management Scheduling
√	√	√	√	√			➢ Fleet Management Facility
							• Fuel and Canister Handling
√	√	√	√	√		√	➢ Operating Requirements
√	√	√	√	√		√	➢ Handling Interfaces
√	√	√	√	√		√	➢ Canister Interfaces
√	√	√	√	√		√	➢ Information Management